U. S. Government

RESEARCH REPORTS

UNIVERSITY OF MICHIGAN
AUG 7 - 1959
ENGINEERING LIBRARY

July 17, 1959
Vol. 32, No. 1

. . . A monthly listing of Government research reports available to industry . . .

In this issue:

Problems of Satellites and Space Operations

A Simple Transistor Test Set

Graphite Technology

Development of Niobium-Base Alloys

Investigation of Design Criteria for Cushioning Materials

Development of Wrought Beryllium Alloys of Improved Properties

Current Status of Cemented Carbide Technology

A Modern, Dynamic Approach to Product Development

Use of Orlon Felt in Glass-Reinforced Polyester Laminates

Complete list of printed reports begins on page 1

U. S. DEPARTMENT OF COMMERCE

Office of Technical Services

The PB Reports . . .

announced in this publication have just been released, usually by agencies of the U. S. Government, for dissemination to the public. In most instances they result from Government or Government-sponsored research.

The Office of Technical Services is responsible, under Public Law 776, 81st Congress, for the collection and distribution of these technical reports in the interest of American science and industry.

The more important reports are reprinted for sale to the public by OTS. Many of the reports are so specialized that the demand for them does not warrant reproduction of printed copies; originals of these documents are deposited at the Library of Congress. There they may be inspected in the Annex Reading Room, or copies may be ordered from the Library in either photocopy or microfilm.

PB reports of special interest to smaller businesses are abstracted in OTS's monthly *Technical Reports Newsletter*, available from the Superintendent of Documents, Washington 25, D. C., at $1 a year domestic, $1.50 foreign.

Since 1945 thousands of business firms have used PB reports in their research programs. These reports now constitute one of the world's largest collections of non-confidential technical information, numbering over 250,000 items. OTS has published catalogs of related reports in more than 300 areas of industrial interest. For further information relative to any of its activities, you are invited to write OTS, U. S. Department of Commerce, Washington 25, D. C.

Except to the extent indicated by acknowledgment of authorship, OTS does not edit PB reports, nor does it accept responsibility for the information and conclusions contained in them. If copyrighted material appears, permission for its use should be requested from the copyright owners. Any national security restrictions that may have applied to these reports have been removed. Patents may cover the subject matter of any report, and the reader is advised to make patent searches before developing applications based on the reports.

How To Order

ALWAYS USE COMPLETE TITLE AND PB NUMBER of each report ordered. The letter "s" accompanying some PB numbers means "supplement," "t" means "translation," and "r" means a partial or complete revision. These letters should be included as part of the PB number. Prepayment is required.

TO ORDER FROM LC • Address your order to Library of Congress, Photoduplication Service, Publications Board Project, Washington 25, D. C. Make check or money order payable to Chief, Photoduplication Service, Library of Congress. State whether report is desired in microfilm or photocopy. Microfilm copies are in 35 millimeter film and require special reading equipment; if you do not have such a machine you may be able to use one at a library in your area.

TO ORDER FROM OTS • Address your order to Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. Make check or money order payable to OTS, Department of Commerce. Reports available from OTS may also be ordered through Department of Commerce field offices.

TO ORDER FROM OTHER SOURCES • When an agency other than OTS or LC is the source, use the full address included in the abstract of the report. Make check or money order payable to that agency.

U. S. GOVERNMENT RESEARCH REPORTS

OFFICE OF TECHNICAL SERVICES
John C. Green, *Director*

Issued monthly. Annual subscription $6 ($3 additional for foreign mailing). Single copy 60 cents. In the U. S. make remittance payable to Superintendent of Documents and mail either to a Department of Commerce field office or to Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Address changes should be sent to Superintendent of Documents. Outside the U. S. make remittance payable to and order from OTS, U. S. Department of Commerce, Washington 25, D. C. Foreign address changes should be sent to OTS.

Contents are not copyrighted and may be reprinted freely. Mention of source will be appreciated.

Use of funds for printing this publication has been approved by the Director of the Bureau of the Budget, July 18, 1958.

CONTENTS

	Page
AGRICULTURE	5
ASTRONOMY	5
Astrophysics	5
BEHAVIORAL SCIENCES	6
Human Engineering	6
Personnel and Training	7
Psychology Space Perceptive	10
BIOLOGICAL SCIENCES	13
Anatomy and Physiology	14
Biochemistry	17
Botany	17
Medical Specialties and Equipment	18
Pathology	18
Radiobiology	18
CHEMISTRY	20
Analytical Chemistry	20
Inorganic Chemistry	20
Organic Chemistry	21
Physical Chemistry	23
EARTH SCIENCES	29
Climatology and Meteorology	29
Geodesy	32
Mineralogy	33
Oceanography	33
Physics of the Atmosphere	33
ENGINEERING	35
Aeronautical Engineering	36
Chemical Engineering	40
Civil Engineering	42
Electrical and Electronic Engineering	43
Mechanical Engineering	64
Ordnance, Missiles, and Satellite Vehicles	64
Sanitation and Safety Engineering	69
Ship Building	71
FOOD, HANDLING, AND PACKAGING EQUIPMENT	73
Packaging	73
MACHINERY, FABRICATION, AND ACCESSORY EQUIPMENT	74
Engines and Propulsion Systems	74
Manufacturing Equipment and Processes	75
Transport, Traction and Hoist Facilities	79
MATERIALS	80
Adhesives and Sealants	81
Ceramics and Refractories	81
Fuels, Lubricants, and Hydraulic Fluids	83
Leather and Textiles	86
Paints and Finishes	86
Photographic Materials	87
Plastics	87
Rubber and Elastomers	88
MATHEMATICS	89
Computing Devices	93
MECHANICS	94
Aerodynamics and Pneumatics	95
Hydrodynamics, Hydraulics, and Hydrostatics	100
Statics, Kinematics, and Kinetics	101
METALLURGY	102
Ferrous Metals	104
Light Metals	105
Nonferrous (except light) Metals	106
Structural Metallurgy and Corrosion	107

	Page
NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY	107
Elementary Particles	108
Instruments and Installations	109
Nuclear Engineering and Power	109
Nuclear Reactions	110
Nuclear Structure	110
Radioactivity	111
PERSONNEL SUPPLIES AND PERSONAL EQUIPMENT	111
PHYSICS	112
Acoustics	112
Electricity and Magnetism	113
Electronics	114
Molecular Physics and Spectroscopy	114
Optics	116
Solid State Physics	118
Theoretical Physics	126
Thermodynamics	126
Wave Propagation	130
RESEARCH METHODS, TECHNIQUES AND EQUIPMENT	132
SOCIAL SCIENCES	133
MISCELLANEOUS	133
ATOMIC ENERGY COMMISSION REPORTS	135
GENERAL	135
BIOLOGY AND MEDICINE	135
CHEMISTRY	136
General	136
Radiation and Radiochemistry	138
Separation Processes for Plutonium and Uranium	138
CONTROLLED THERMONUCLEAR PROCESSES	138
CRITICALITY STUDIES	139
GEOLOGY AND MINERALOGY	139
HEALTH AND SAFETY	140
INSTRUMENTS	140
METALLURGY AND CERAMICS	140
PARTICLE ACCELERATORS AND HIGH VOLTAGE MACHINES	142
PHYSICS AND MATHEMATICS	142
PROGRESS REPORTS	145
RADIATION EFFECTS ON MATERIALS	145
RADIOACTIVE WASTE	145
REACTORS	145
General	145
Power	146
TECHNOLOGY	148
Feed Materials	148
Raw Materials	148
SOURCE INDEX	I-1
SUBJECT INDEX	I-15
NUMBER INDEX	I-35

Printed Reports Available from OTS Announced in This Issue

Page

BEHAVIORAL SCIENCES

Aspects of pilot decision making. Dec 58. 63p. (PB 151 744) $1.75 8

Polydiagnostic method of multiple forced-choice rankings in design analysis. Dec 58. 41p. (PB 151 681) $1.25 6

BIOLOGICAL SCIENCES

Effect of forward acceleration on vital capacity. Dec 58. 11p. (PB 151 690) 50 cents 14

CHEMISTRY

Decarborane Grignard reagents and the formation of substituted decaboranes. Aug 58. 18p. (PB 151 305) 50 cents 20

Determination of the applicability of certain photochemical reactions to photography. 1956. 94p. (PB 151 178) $2.25 24

Effect of pressure on the racemization of nitro diphenic acid. Nov 57. 20p. (PB 151 323) 75 cents 23

Survey of the role of chemistry in premixed combustion phenomena. Oct 57. (PB 151 238) $2.75 24

ENGINEERING

Advanced energy sources and conversion techniques. Nov 58. 256p. (PB 151 461) $4.00 35

Approximate airframe transfer functions and applications to single sensor control systems. June 58. 236p. (PB 151 718) $3.50 38

ARDC production design handbook. Dec 58. 271p. (PB 151 724) $4.00 36

Determination of the daytime conspicuity of a small airplane in a terminal area. Jan 59. 18p. (PB 151 600) 50 cents 39

Determination of means to safeguard rotary-wing aircraft from powerplant fires in flight. Part I. Fire-detection and fire-resistance studies of a Sikorsky H-5A helicopter. Feb 59. 26p. (PB 151 599) 75 cents 39

Equipment maintenance with various numbers of service men: A simple analysis. Nov 58. 42p. (PB 151 683) $1.25 64

Evaluation of a dielectric heating method for drying black walnut gunstock blanks. Feb 58. 15p. (PB 151 301) 50 cents 69

Evaluation of fire-detection systems proposed for the Martin YP6M airplane. Dec 58. 10p. (PB 151 577). 50 cents. 39

Gust alleviation study. Part I. Estimation of the control derivatives for flaps, spoilers, and other control devices intended for use as gust alleviators. Jan 58. 203p. (PB 151 710) $3.50 37

Gust alleviation study. Part III. Prediction of the alleviation of gust loads on a rigid restrained wing utilizing wing installed alleviator devices. Jan 58. 188p. (PB 151 713) $3.00 37

Page

Gust alleviation study. Part IV. Estimated indicial life responses of flap and spoiler control devices at subsonic speeds. Jan 58. 23p. (PB 151 714) 75 cents 37

Multi-field electronic tachistoscope. Dec 58. 11p. (PB 151 689) 50 cents 43

Preconversion of oxide cathodes. Mar 59. 11p. (PB 151 442) 50 cents 57

Problems of satellites and space operations. Apr-July 58. 111p. (PB 151 410) $2.50 67

Runway distance markers. May 57. 32p. (PB 131 217) $1.00 37

Simple transistor test set. Aug 57. 9p. (PB 151 300) 50 cents 45

Simulation tests of a tactical airway system. Jan 59. 29p. (PB 151 579) 75 cents 39

Special measurement techniques for thermoelectric materials with results for Bi_2Te_3 and alloys with Bi_2Se_3. June 58. 19p. (PB 151 656) 50 cents 46

Study of the helicopter crash-fire problem. Feb 59. 22p. (PB 151 578) 75 cents 40

Survey of fundamental knowledge of mechanisms of action of flame-extinguishing agents. Sep 58. 22p. (PB 121 853S) 75 cents 40

Theoretical design of primary and secondary cells. Part II. Effect of polarization and internal resistance on cell characteristics and cell design. Dec 58. 30p. (PB 151 057) 75 cents 58

FOOD, HANDLING, AND PACKAGING EQUIPMENT

Investigation of design criteria for cushioning materials. Mar 59. 35p. (PB 151 720) $1.00 73

MACHINERY

Current status of cemented carbide technology. June 58. 37p. (PB 151 302) $1.00 78

Department of Defense titanium sheet rolling program. Mar 59. 93p. (PB 151 065) $2.25 76

Foundry characteristics of Mn-V-Mo age-hardening austenitic steel. Mar 59. 12p. (PB 151 539) 50 cents 77

Graphite technology. Jan 59. 73p. (PB 151 682) $2.00 76

Investigation of jet flameholders. Part II. Apr 57. 27p. (PB 131 269) 75 cents 75

Modern dynamic approach to product development. Dec 58. 206p. (PB 151 649) $3.50 78

Study of the weldability of aluminum casting alloys with 5086 wrought aluminum alloy. Sep 58. 56p. (PB 151 307) $1.50 78

MATERIALS

Behavior of fuels and lubricants in dynamic test equipment operating in the presence of gamma radiation. Mar 58. 198p. (PB 151 701) $3.00 85

Coatings for protecting molybdenum from oxidation at elevated temperature. Mar 59. 45p. (PB 151 064) $1.25 86

Page

Development of schematic analytical procedures for synthetic lubricants and their additives. Part IV. Laboratory manual for the analysis of synthetic lubricants, greases and their additives. July 57. 297p. (PB 131 414) $6.00 84

Effect of prolonged stress on glass-reinforced polyester laminates. Nov 57. 6p. (PB 151 298) 25 cents 88

Investigation of the mechanical properties of cermets as related to the microstructure. Jan 59. 95p. (PB 151 722) $2.25 81

Literature survey of combustion flames. Apr 57. 376p. (PB 151 237) $5.00 84

Phantom transparency technique of negative revision. Mar 59. 16p. (PB 151 648) 50 cents 87

Research for coatings for protection of niobium against oxidation at elevated temperatures. Feb 59. 74p. (PB 151 684) $2.00 86

Sprayable strippable film container outdoor storage tests. July 58. 31p. (PB 151 299) $1.00 88

Synthesis of diene elastomers by means of stereospecific catalysts: A literature survey. Feb 58. 52p. (PB 151 433) $1.50 89

Use of orlon felt in glass reinforced polyester laminates. July 58. 11p. (PB 151 297) 50 cents 81

MECHANICS

Experimental study of the effects of non-uniform wall temperature on heat transfer in laminar and turbulent axisymmetric flow along a cylinder. July 58. 68p. (PB 151 680) $1.75 96

Extraction of aircraft stability coefficients from flight test data and theoretical and experimental studies on selected problems of high speed aerodynamics and dynamic stability. Dec 57. 150p. (PB 151 719) $2.75 97

On the representation of dynamic pressure in analog simulations involving large changes in atmospheric density. Aug 58. 17p. (PB 151 709) 50 cents 95

Transient heat transfer in laminar flow in the entrance region of tubes with heat capacity. Jan 59. 94p. (PB 151 717) $2.25 97

METALLURGY

Charpy-V transition temperatures of ferritic iron alloys. Part I. Iron-oxygen and iron-aluminum. Apr 59. 19p. (PB 151 555) 50 cents 104

Compilation of available information on the Ti-7Al-(3-4) Mo alloy. July 58. 99p. (PB 151 322) $2.25 105

Development of new mechanisms and techniques for obtaining steels in the ultrahigh strength range. May 57. 56p. (PB 131 238) $1.50 104

Development of niobium-base alloys. Mar 59. 192p. (PB 151 739) $3.00 104

Development of wrought beryllium alloys of improved properties. Feb 59. 154p. (PB 151 711) $3.00 106

Mechanical properties of AM35O and AM 355 stainless steels. Feb 59. 53p. (PB 151 706) $1.50 102

Oxidation of experimental alloys. Feb 59. 19p. (PB 151 741) 50 cents 103

Thermal properties of certain metals. Part II. Iron, beryllium, iridium, palladium, platinum, and tungsten. Sep 58. 321p. (PB 151 679) $5.00 103

Page

MISCELLANEOUS

Report of NRL progress. June 59. (PB 151 339) $1.25, $10.00/year 133

NUCLEAR PHYSICS

Geiger counter for large diameter sources. June 58. 17p.
(PB 151 321) 50 cents..... 109

Man-machine factors in the NRL nuclear reactor control system.
Mar 59. 23p. (PB 151 732) 75 cents..... 109

Natural aerosols and nuclear debris studies. Sep 58. 50p.
(PB 151 731) $1.25..... 107

PHYSICS

Improved torgue magnetometer. Sep 58. 33p. (PB 151 721) $1.00..... 114

Infrared dispersion and the determination of absorption coefficients.
Mar 59. 23p. (PB 151 443) 75 cents..... 117

Long term magnetic stability of alnico V and other permanent magnet
materials. Dec 58. 74p. (PB 151 716) $2.00..... 113

Nucleate boiling literature search. Apr 57. 56p. (151 304) $1.50..... 128

Radiative properties of high temperature air. Sep 58. 81p.
(PB 151 646) $2.25..... 127

Thermal buckling of circular cylindrical and conical thin-walled shells.
Apr 58. 169p. (PB 151 740) $3.00..... 129

Thermophysical properties of solid materials. Jan 59. 430p.
(PB 151 715) $6.00..... 126

Ultrasoft X-ray physics and applications. June 57. 88p.
(PB 151 182) $2.25..... 118

U. S. Government RESEARCH REPORTS

U. S. DEPARTMENT OF COMMERCE

OFFICE OF TECHNICAL SERVICES

Vol. 32, No. 1 Pp. 1 - 148 July 17, 1959

AGRICULTURE

School of Aviation Medicine, Randolph AFB, Tex.
A PHOTOSYNTHETIC GAS EXCHANGER CAPABLE OF PROVIDING FOR THE RESPIRATORY REQUIREMENT OF SMALL ANIMALS, by Robert D. Gafford and Charles E. Craft. Jan 59, 14p. 11 refs. Rept. 58-124.
Order from LC mi$2.40, ph$3.30 PB 139 841

A photosynthetic gas exchanger capable of producing 10 liters of oxygen per day has been designed. The gas exchanger can provide oxygen for, and take up carbon dioxide from, four 30-gram mice on a continuous basis. The production of carbon monoxide by the plant and the successful elimination of the CO produced is described.

ASTRONOMY

Astrophysics

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
BIBLIOGRAPHY OF EXTRATERRESTRIAL RADIO NOISE. FIRST QUARTERLY LIST OF RECENT PUBLICATIONS, by Martha Stahr Carpenter. Rept. on Contract Nonr-401(22). 15 Sep 57, 31p. 230 refs. Research rept. EE 353; AD-159 140.
Order from LC mi$3.00, ph$6.30 PB 135 731

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
LIMITATIONS ON THE ACCURACY OF ANGULAR LOCATION OF A RADIO STAR USING INTERFEROMETER TECHNIQUES, by L. S. Wagner. Master's thesis. Scientific rept. no. 1 on Contract AF 30(635)2886. 30 June 58, 178p. 13 refs. Research Rept. EE 378; RADC-TN-58-255; AD-148 911.
Order from LC mi$8.10, ph$27.30 PB 136 573

A discussion of the radio interferometry technique as a means of separating two noise signals, one of which originates from a point source and the other from a celestially distributed source, is presented. Radio interferometry is discussed in terms of a correlation process in which the discrete source signals induced in the interferometer antennas are correlated, while the distributed source signals induced in the interferometer antennas are uncorrelated. The phase switched radio interferometer and the correlation detector interferometer are considered in terms of the manner of implementation of the correlation process. The role of the noncoherent detector in the phase switched radio interferometer is stressed.

Maryland U., College Park.
SUMMARY OF RESULTS OF RESEARCH STUDY. Rept. of Contract AF 18(600)1038. [1958] 19p. 32 refs. AFOSR TN-59-168; AD-211 147.
Order from LC mi$2.40, ph$3.30 PB 139 992

During the performance of the contract, a great deal of theoretical work was done on various aspects of cosmic rays and auroral particles, in particular their behavior in magnetic fields, on cosmic ray albedo and on the trapping of particles in the earth's dipole field.

Warner and Swasey Observatory, Cleveland, Ohio.
THE DISTRIBUTION OF CARBON STARS IN SIX SELECTED REGIONS OF THE MILKY WAY, by J. J. Nassau and V. M. Blanco. Final rept. on Contract Nonr-1141(02). 30 June 58, 4p.
Order from LC mi$1.80, ph$1.80 PB 139 859

New Mexico U., Albuquerque.
LARGE SCINTILLATOR FOR OBSERVATION OF COSMIC RAYS, by John R. Green. Rept. on Contract AF 49(638)34. July 57, 17p. AFOSR TN-57-433; AD-136 423.
Order from LC mi$2.40, ph$3.30 PB 135 155

A liquid scintillator having an area of $5m^2$ has been developed for observation of cosmic rays. Details of construction and of certain of the electronic circuits are given.

BEHAVIORAL SCIENCES

Human Engineering

Army Ordnance Human Engineering Lab., Aberdeen Proving Ground, Md.
DISCRIMINABILITY OF AAOC SYMBOLS, by Joseph F. Dardano and John A. Stephens. May 58, 28p. 5 refs. Technical memo. 4-58.
Order from LC mi$2.70, ph$4.80 PB 133 125

Relative discriminability of 4 geometric shapes considered for use as radar symbols, cross, cross-within-circle, circle, and half circle, were examined at size levels ranging from 1/8" to 1/2" at intervals of 1/16". The shapes were electronically generated by apparatus designed for installation in the Anti-aircraft Fire Control System M-33 PPI. The cross and circle were more discriminable than the half circle and cross-within circle; these differences were independent of size level. Minimum size at which discriminability was not impaired lay between 3/16" and 5/16". At 2/16" size, there were extreme increases in scanning time and omissions for all symbols. Subjects did not agree in their ratings of ease of discriminating each shape. Some possible determinants of discriminability are discussed.

[Army Ordnance] Human Engineering Lab., Aberdeen Proving Ground, Md.
LITERATURE REVIEW: TRACKING CONTROL MECHANISMS AND DISPLAYS (LIGHT ANTIAIRCRAFT SYSTEM ORIENTED) by Samuel A. Hicks, Dec 57, 17p. 46 refs. Technical memo. no. 9-57; AD-158 197.
Order from LC mi$2.40, ph$3.30 PB 135 348

A review of the literature dealing with tracking (general), control systems, display systems, compensatory, vs. visual displays is presented. It is intended to have implication in the design of fire control systems for low altitude antiaircraft weapons.

Bio-Mechanics Lab., Tufts U., Medford, Mass.
THE POLYDIAGNOSTIC METHOD OF MULTIPLE FORCED-CHOICE RANKINGS IN DESIGN ANALYSIS, by Edward M. Bennett, Dorothy K. Kemler, and Patricia S. Allen. Rept. on Biophysics of Space Flight, Contract AF 33(616)3068. Dec 58, 41p. 15 refs. WADC Technical rept. 58-308; AD-210 120.
Order from OTS $1.25 PB 151 681

In military operations user acceptance is no less important than in the public markets. Many functional items fail to achieve their purposes because the rank and file of the military organization is resistant to using the new item. Consequently an otherwise useful item is rejected and gathers dust in supply rooms. With this in mind, the present report outlines one of the newer psychophysical methods, the polydiagnostic method of multiple forced-choice rankings, and its applications to the area of design analysis and prediction of product acceptability. Three examples of the method are included. The first example considers one of the most commonly used industrial designs - the telephone handset. The second and third examples are drawn from the area of crew habitability in minimum spaces during extraordinary flights of long duration. They consider one of the more vital elements of the crew station - the seat on which a man might be expected to remain for many hours during many days or weeks.

Department of the Army, Washington, D. C.
ARMY ENGINEERING PSYCHOLOGY CONFERENCE NO. 2, 7-9 NOV 1956, ARMY MEDICAL RESEARCH LABORATORY, FT. KNOX, KY. Conference rept. 21 Dec 56. 77p.
Order from LC mi$4.50, ph$12.30 PB 139 885

Contents:
Army engineering requirements for human factors R&D
Summary of Army actions taken on recommendations of previous conference
Summaries of technical service presentations to the conference
Summaries of CONARC board presentations to the conference
Summaries of conference working group recommendations and discussions (See also PB 139 884)

Department of the Army, Washington, D. C.
ARMY HUMAN ENGINEERING CONFERENCE, THE PENTAGON, 14-15 DECEMBER 1955. Conference rept. [1956] 94p.
Order from LC mi$5.40, ph$15.30 PB 139 884

Contents:
On human engineering, by William H. Martin
Army policy affecting human engineering research, by Lynn E. Baker
Abstracts of technical service presentations to the conference

Human Resources Research Office, George Washington University, Washington, D. C.
RECOGNITION OF VEHICLES BY OBSERVERS LOOKING INTO A SEARCHLIGHT BEAM, by Howard C Olson, Albert E. Goss and William D. Voiers. Technical rept. 49 on Contract DA 44-109-qm-650. July 1958; AD-200 848.
Order from LC mi$3.30, ph$7.80 PB 135 955

Information useful for night combat tactics was gathered on how soon average observers facing a searchlight recognized tank-size vehicles approaching from the light. Variables included observer distance and position, and vehicle path and type. Similar recognition data were collected under conditions of darkness. When vehicle path and observer were near beam center, recognition generally occurred about 250 yards sooner than it did when vehicle path was across the beam from the observer; under the latter condition recognition generally did not occur until the vehicle neared or entered the beam (or almost as long as in darkness). Recognition range was 75 yards greater for tank than for truck; a masking noise had little effect on recognition range.

Institute of Applied Psychology, U. of Maryland, College Park.
STUDIES OF BEHAVIORAL EFFICIENCY, by T. G. Andrews and Sherman Ross. Summary rept. 1951-1954, on Contract DA 47-007-MD-222. 1 Jan 55, 30p. 28 refs.
Order from LC mi$2.70, ph$4.80 PB 140 325

Contents:
General scope and phases of the research
Experimental studies on fatigue
Tabular summary of studies on fatigue
Experimental studies of stress, motivation and anxiety
Tabular summary of studies on stress
Experimental studies emphasizing signal control factors as related to human engineering

Psychological Lab., Johns Hopkins U., Baltimore, Md.
STUDY OF FACTORS AFFECTING OPERATION OF THE VG REMOTE PPI, by W. R. Garner. Rept. 166-1-1 on Contract N5ori-166(01). 15 Aug 46, 38p.
Order from LC mi$3.00, ph$6.30 PB 136 567

A study was undertaken at the Systems Research Field Laboratory to determine the effects of various electronic and optical factors on the operation of the VG. Among the factors studied are the video gain, the CRT bias, the limiting of PPI adapters, use of a higher accelerating voltage on the CRT, the type of viewing screen, and the intensity of the reflected light. An analysis of the operation of the VG was made in terms of detectibility (ability of the targets to be seen), variability of detectibility scores, and discriminability (ability of targets to be distinguished from each other). Each of these factors was studied separately and in relation to the other factors.

Rochester U., N. Y.
THE EFFECT ON PERFORMANCE OF VARYING THE DIRECTIONS AND PLANES OF MOVEMENT OF THE CONTROL CRANKS ON A COMPENSATORY TRACKING TASK, by R. F. Green, Eugenia B. Norris, and S. D. S. Spragg. Rept. on Contract N6onr-241(06). 1 Aug 55, 7p. Technical rept. SPECDEVCEN 241-6-18.
Order from LC mi$1.80, ph$1.80 PB 127 653

No reliable differences between any of the various display-control relationships investigated were obtained. It would appear, then, that "following" and "compensatory" tracking tasks differ markedly in that optimum display-control relationships could be identified for "following" tracking but not for "compensatory" tracking.

Personnel and Training

Adjutant General's Office, Washington, D. C.
ASSESSMENT OF NCO LEADERSHIP (TEST CRITERION DEVELOPMENT) by Alexander R. Robins, Howard L. Roy and John E. de Jung. July 58, 26p. PRB Technical Research Rept. no. 4.
Order from LC mi$2.70, ph$4.80 PB 140 324

The Leadership Performance Battery (LPB) was constructed as a measure of "leadership in action" for application in the evaluation of NCO performance. The Battery is composed of three standarized tests which are job samples of observed behavior considered crucial in differentiating good from poor NCO's. Performance on each of the three tests—Command Presence, Leadership Problems, and Field Leadership—is judged strictly in accordance with the standardized scoring instructions furnished. This report presents evidence that the LPB yields stable measurements and further that it differentiates examines in expected directions with respect to known NCO leadership requirements.

Adjutant General's Office, Washington, D. C.
PREDICTION OF SUCCESS IN AIRCRAFT MAINTENANCE COURSES, by William H. Helme and Robert F. Boldt. Sep 58, 12p. 1 ref. PRB Technical research note 97; AD-200 322.
Order from LC mi$2.40, ph$3.30 PB 139 906

The effectiveness of the Army Classification Battery (ACB) composites for predicting success in three Aircraft Maintenance courses was studied. The results indicated that Aptitude Area MM, the current selector, has fairly satisfactory validity of .59 for Airplane Repair, but less satisfactory validity for Army Helicopter Maintenance and Helicopter Repair, .42 and .51, respectively. The predesignated alternate Area GM has equal or lesser validity than MM, with coefficients of .58, .42, and .44, respectively. It was concluded that MM should be retained as the selector while current research effort to find better predictive instruments continues. Analysis of the effectiveness of cutting scores on MM from 90 to 110 suggests retention of the current prerequisite of 100 for all three courses.

Adjutant General's Office, Washington, D. C.
PREDICTION OF SUCCESS IN PHOTOGRAPHY COURSES, by W. H. Helme, L. Harold Sharp and R. K. White. Dec 57, 16p. PRB Technical Research note 85.
Order from LC mi$2.40, ph$3.30 PB 135 124

This study was one of a series evaluating the Army Classification Battery (ACB) for effectiveness in predicting success in Army school courses. The objective was to determine the effectiveness of various com composites of ACB test scores for predicting performance in the Motion Picture Photography—Enlisted, and Still Photography and Photographic Laboratory Procedures courses. Scores on the Aptitude Area of selection and scores on an alternate Aptitude Area were compared with final course grades of 1607 trainees who completed the course between January 1954 and October 1955. In addition, a study was made of the effect of using different cutting scores as prerequisites to entering both courses. The current operational Aptitude Area of selection, General Technical, was found to be more satisfactory for these courses than the alternate Aptitude Area, General Maintenance. It was determined that a reduction in the cutting score from 90 to 80 for the courses would probably increase the pool of qualified students substantially without materially increasing the attrition rate in these courses.

Adjutant General's Office, Washington, D. C.
PREDICTION OF SUCCESS IN SELECTED PRECISION AND AUTOMOTIVE MAINTENANCE JOBS, by William H. Helme and Robert F. Boldt. Oct 58, 18p. 5 refs. PRB Technical research note 98; AD-200 400.
Order from LC mi$2.40, ph$3.30 PB 139 905

This study was one of a series evaluating aptitude area composites of the Army Classification Battery (ACB) for effectiveness in predicting performance in four jobs in the Precision Maintenance Occupational Area and in six jobs in the Motor Maintenance Occupational Area of the Enlisted MOS Classification Structure. Scores on the ACB, on ACB test composites, and on final grades obtained in Army school courses prerequisite to assignment, were compared with supervisor and associate ratings of job performance of a total of 1430 men. Aptitude Area GM, General Maintenance, was not as valid a selector for three of the precision maintenance jobs as were the alternate aptitude area composites specifically predesignated for these jobs--MM for two jobs and CL (Clerical) for the other. Findings on the fourth precision maintenance job were inconclusive. Aptitude Area MM, Motor Maintenance, had validity consistently superior to the predesignated alternate, GM, for five of the six motor maintenance jobs. A consideration of both job and prior school validity results was the basis for recommendations that the selector for Ammunition Storage Specialist be changed from GM to CL and that the feasibility of changing the selector from GM to MM for the jobs of Fire Control Instrument Repairman and Turret Artillery Repairman be studied.

Air Force Personnel and Training Research Center, Lackland AFB, Tex.
DEVELOPMENT AND ANALYSIS OF A PROFICIENCY TEST FOR IDENTIFICATION OF ON-THE-JOB TRAINING NEEDS, by Wilton P. Chase. Mar 57, 47p. 1 ref. AFPTRC-TN-57-28; AD-98 933.
Order from LC mi$3.30, ph$7.80 PB 128 779

Extensive on-the-job training programs have been established within operational commands of the Air Force for the purpose of increasing the job competency of personnel. A practice often followed in scheduling individuals for training is for immediate supervisors to make these assignments on the basis of their judgments of training needs. The lack of an objective standard, and the inability of supervisors to identify precisely the job areas for which further training is needed, leads to inefficient scheduling of training for individuals. Written proficiency tests organized in terms of job areas provide an objective means of identifying the specific needs of individuals for further training.

Air Force Personnel and Training Research Center, Lackland AFB, Tex.
THE EFFECT ON ATTITUDE CHANGE OF MAJORITY OPINION PRESENTED WITH AND WITHOUT ARGUMENTS, by Walter H. Crockett (U. of Michigan). Mar 57, 33p. 17 refs. AFPTRC-TN-57-35; AD-98 940.
Order from LC mi$3.00, ph$6.30 PB 128 780

The evidence indicates that the group informed of the majority opinion did not change in attitude significantly more than did the Control Group. However, in the Experimental Group given both the majority opinion and supporting rationale, attitudes were effectively modified, and the relationship between affect and attitude change was shown clearly. The results indicate that a shift in attitude toward the group norm may require a reorganization of interrelated beliefs for some individuals. However, unless the information seems plausible, attitudes may not be much altered by knowledge of the majority opinion. Presumably, those who do not have a broad cognitive range and have not reached a firm decision may be expected to change their attitudes more readily.

Air Force Personnel and Training Research Center, Lackland AFB, Tex.
FLIGHT-LINE TROUBLESHOOTING TRAINER FOR A COMPLEX ELECTRONIC SYSTEM: MAC-2 TRAINER, by Robert Stanton French and Lowell B. Martin. July 57, 16p. 6 refs. AFPTRC-TN-57-106; AD-134 227.
Order from LC mi$2.40, ph$3.30 PB 132 988

This report describes the basic features of a trainer for the MA-7A Bomb-Navigational System which was developed as a possible solution to this need for individual troubleshooting practice.

Applied Psychological Services, Villanova, Pa.
POST-TRAINING PERFORMANCE: CRITERION DEVELOPMENT RESEARCH, by Milton Richlin, Arthur I. Siegel, and Philip Federman. Annual summary rept. on Contract Nonr-2279(00). 15 Nov 57, 104p. 12 refs.
Order from LC mi$5.70, ph$16.80 PB 136 699

This report describes the progress made during the first eight research months. The theoretical framework and criterion development techniques are described in Section II of this report. Section III describes the rates selected for study, the sample involved, and the data obtaining phase. Finally, Section IV summarizes the study to date and projects the future use of the method and findings.

Bureau of Naval Personnel, Washington, D. C.
ABSTRACTS OF RESEARCH REPORTS. Mar 58, 86p. 128 refs.
Order from LC mi$4.80, ph$13.80 PB 135 867

Part I of these abstracts covers all research reports published during the period January 1951 through September 1957 by the Personnel Measurement Research Branch in the area of selection and classification research. Part II will cover reports of performance and training evaluation research for a similar period of time and will be issued at a later date.

Hughes Aircraft Co., Culver City, Calif.
ASPECTS OF PILOT DECISION MAKING, by Alexander C. Williams, Jr. and Charles O. Hopkins. Rept. on Study Program for Cockpit Instrument Displays for the 1970 Era, Contract AF 33(616)5135. Dec 58, 63p. 103 refs. WADC Technical rept. 58-522;

AD-209 382.
Order from OTS $1.75 PB 151 744

A detailed analysis was made of the tasks performed by the pilot of a modern airborne weapon system. The results of this analysis were coded and presented in diagrammatic form to show alternative courses of action that may result in successful completion of a mission phase. Instances of pilot decision making so as to encompass these instances was proposed. The more prominent decision theories were reviewed briefly and the applicability of each theory to the problem of pilot decision making was considered. Problem areas requiring experimental study were discussed and some approaches to the study of these problems were suggested.

Naval Personnel Research Field Activity, San Diego, Calif.
THE NROTC CAREER MOTIVATION TEST: A COMPARISON AMONG DIFFERENTIALLY MOTIVATED GROUPS OF NROTC APPLICANTS, by Bernard Rimland and John H. Steineman. Apr 58, 14p. 3 refs. BuPers Technical Bulletin 58-2.
Order from LC mi$2.40, ph$3.30, PB 135 852

This investigation was undertaken to determine if expected differences in career motivation among several different groups of NROTC applicants are reflected as obtained differences in mean scores on the Career Motivation Test (CMT), a personality-type test designed to measure career proneness.

Navy Experimental Diving Unit, Naval Gun Factory, Washington, D. C.
NITROGEN-OXYGEN MIXTURE PHYSIOLOGY. PHASE 4: CARBON DIOXIDE SENSITIVITY AS A POTENTIAL MEANS OF PERSONNEL SELECTION. PHASE 6: CARBON DIOXIDE REGULATION UNDER DIVING CONDITIONS, by E. H. Lanphier. 30 June 58, 31p. 12 refs. Research rept. 7-58.
Order from LC mi$3.00, ph$6.30 PB 135 952

Resting subjects were exposed to mixtures containing elevated CO_2 concentrations until the end-expiratory pCO_2 reached 45, 50, 55 and 60 mm. Hg. The RMV was recorded at each pCO_2 level. The end-expiratory pCO_2 of subjects swimming at the surface and at depths of 26 ft. and 99 ft. was measured while breathing air, oxygen, 55% nitrogen - 45% oxygen and 55% helium - 45% oxygen. In some experiments the respiratory resistance and dead space was also varied. All individuals demonstrated a tendency to retain carbon dioxide when swimming at moderate depth especially when breathing N_2 - O_2 mixtures. Increased breathing resistance and dead space favored CO_2 retention. When breathing H_eO_2 mixtures CO_2 retention is absent or small. The degree to which individuals retain CO_2 varies and there is a relationship between this tendency and their ventilatory response to CO_2. Nitrogen-oxygen mixtures should be abandoned in favor of helium-oxygen mixtures for mixed-gas scuba diving.

Personnel Lab., Lackland AFB, Tex.
MEASUREMENT OF INTELLECTUAL EFFICIENCY IN AN ASSESSMENT OF 100 AIR FORCE CAPTAINS by Donald G. Woodworth and Donald W. MacKinnon. Nov 57, 55p. 15 refs. AFPTRC-TN-57-128; AD-134 260.
Order from LC mi$3.60, ph$9.30 PB 135 627

The present study was to investigate the relationships between various aspects of intellectual functioning and the operational performance. Four major factors emerged: (1) Functionally effective general intelligence, (2) Visual form-problem solving ability, (3) Effectiveness and originality in complex problem solution, and (4) Over-all general effectiveness.

Personnel Research and Development Corp., Cleveland, Ohio.
THE INFLUENCE OF RATING SCALE CONSTRUCTION UPON THE CHARACTERISTICS OF THE RATINGS RENDERED. Technical rept. on Contract Nonr-2221(00). 15 Nov 57, 23p. 2 refs.
Order from LC mi$2.70, ph$4.80 PB 136 696

The present study was designed to test the hypothesis that the results previously obtained were a function in part at least of the care that had been taken in scale construction.

Personnel Research Lab., Lackland AFB, Tex.
COMPARISON OF TWO GROUPS OF MECHANICS ON SPECIFIC MAINTENANCE KNOWLEDGES, by Chester J. Judy and John G. Adair. Dec 57, 25p. 4 refs. AFPTRC-TN-57-139; AD-146 413.
Order from LC mi$2.70, ph$4.80 PB 135 900

This investigation sought the answers to two questions asked with respect to eight areas of knowledge covering the maintenance of an important new weapon system: 1) Is there a difference, on the whole, in test performance of field trained mechanics as compared with technical-school trained mechanics? 2) Is there a difference, at particular levels of mechanical aptitude and maintenance experience in the test performance of these two groups of mechanics? For none of the knowledge areas was there a statistically significant difference in favor of either group. At particular levels of mechanical aptitude and maintenance experience, however, "regions of significance" were identified wherein one group or the other was distinctly superior. Except for two knowledge areas, field training seemed generally best for high-aptitude, high-experience mechanics; technical-school training seemed generally best for low-aptitude, low-experience mechanics.

Richardson, Bellows, Henry and Co., Inc., New York.
THE RELATIONSHIP OF METHOD OF INSTRUCTION TO TRAINEE APTITUDE PATTERN, by Harold A. Edgerton. Rept. on Contract Nonr 2313(00). 15 June 58, 55p. 3 refs.
Order from LC mi$3.60, ph$9.30 PB 139 831

The experiment reported tested two methods of teaching. One method of teaching was a strictly rote method. The second method asked that, in so far as possible, the instructor present explanations, get the

students to ask why, and call for explanations of the various concepts. The subject matter of the course includes mathematics, electricity, mechanics, introductory orientation to aviation, and the like. Two parts of this course were chosen as the experimental periods of instruction. These were Phase III, mechanics, Mathematics, and Physics, and Phase I, Unit 4a, Aircraft Familiarization. Results of the instruction were measured by objective-type examinations given by the school. The same set of examinations was used for all experimental groups.

School of Aviation Medicine, Randolph [AFB] Tex.
PILOT CANDIDATE SELECTION RESEARCH PROGRAM. IV. TEST VALIDITIES AND INTER-CORRELATIONS, by Robert B. Payne, Frederick H. Rohles, Jr., and Bart B. Cobb, Jr. Jan 52, 31p. 4 refs. Proj. no. 21-29-008, rept. no. 4.
Order from LC mi$3.00, ph$6.30 PB 135 462

The principal contributions of this program at present are (1) a substantial enlargement of the pool of useful psychological selection devices, and (2) a vast multiplication of fundamental data essential to a better understanding of the factorial composition of various tests and of the criterion itself. In several instances, the data constitute the first empirical standards against which specific test theory can be evaluated.

School of Aviation Medicine, Randolph [AFB] Tex.
PILOT CANDIDATE SELECTION RESEARCH PROGRAM. V. FACTORIAL STUDY OF THE MOTOR APTITUDES AREA, by Merrill Roff (Inst. of Child Welfare). Rept. on Contract AF 41(128)160. Mar 53, 26p. 5 refs. Proj. no. 21-29-008, rept. no. 5.
Order from LC mi$2.70, ph$4.80 PB 135 461

This report deals primarily with performance tests in psychomotor area, which require not only comprehension and the making of right decisions quickly, but also the making of rapid and effective movements in a variety of situations. (See also PB 135 462)

School of Aviation Medicine, Randolph [AFB] Tex.
SHORT-DURATION AUDITORY FATIGUE AFTER WHITE-NOISE STIMULATION. DEVELOPMENT OF A ROUTINE TEST PROCEDURE, by Juergen Tonndorf and Francis A. Brogan. Feb 53, 17p. 21 refs. Proj. no. 21-1203-0001, rept. no. 3.
Order from LC mi$2.40, ph$3.30 PB 135 470

After discussion of the phenomenon of reversible auditory fatigue and its relation to permanent noise-induced hearing loss and to auditory adaptation, a test method is described which employs short-duration (2 sec.) exposure to intense (110 db) white noise. The ensuing threshold shift was determined for click, white-noise, and pure-tone signals (probes) at various intervals after exposure. Evaluated from the results were: the initial threshold shift after stimulation (shortest interval, 25 msec.), the pattern of the return to the resting level, and the trend of an aftereffect which begins to appear approximately 1,000 msec. after stimulation. This aftereffect consisted either of a threshold improvement or a secondary drop. Results on a small group of trained listeners, as well as on larger groups of untrained subjects, indicate that the procedure is applicable for routine testing and that the combination of white-noise stimulation and click probes may yield more significant information as to differentiation of subjects than other combinations. It is intended that this method be employed in a follow-up study in order to determine whether or not there is a correlation between reversible auditory fatigue and permanent noise-induced hearing loss which would then permit utilization of this method for prediction of susceptibility to noise.

Teachers Coll., Columbia U., New York.
EMPIRICAL APPROACH TO THE DETERMINATION OF AIR FORCE JOB FAMILIES, by Robert L. Thorndike, Elizabeth P. Hagen and others. Rept. on Contract AF 18(600)1208. Aug 57, 49p. 4 refs. AFPTRC TR-57-5; AD-134 239.
Order from LC mi$3.30, ph$7.80 PB 135 082

This report deals with the exploration of a new technique for assessing job requirements, and for grouping jobs into homogeneous job families. A Job Activities Blank was developed which gave scores for 14 aspects of job requirements selected as being relatively independent. The method was only partly successful. This is thought to have been due primarily to difficulty in designing satisfactory items. It seems unlikely that this approach will have useful practical applications unless considerably more effective items can be developed for the scales of job requirements.

Psychology—Space Perception

Aero Medical Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
EFFECT OF A COMBINATION OF NOISE AND FATIGUE ON A COMPLEX COUNTING TASK, by Harry J. Jerison. Dec 55. 31p. 4 refs. WADC Technical rept. 55-360; AD-95 232.
Order from LC mi$3.00, ph$6.30 PB 130 361

To study effects of environmental stress on human performance, tests showing orderly performance changes under such conditions have to be developed. This report presents a detailed description and analysis of performance changes on a promising test involving keeping a complex mental count. Subjects worked on the test continuously for two hours, and during the second and third half hours of the work period, noise of about 110 db over-all sound level was present. Performance changes, although presumably related to both noise and fatigue, are analyzed in terms of the characteristics of the test - time at work, and required counting rate - and not in terms of the environmental stress. Differential effects of noise and fatigue on performance on a shorter version of this test will be described in a separate report.

Applied Mathematics and Statistics Lab., Stanford U., Calif.
AXIOMATIZATION OF THURSTONE'S SUCCESSIVE INTERVALS AND PAIRED COMPARISONS SCALING MODELS, by Ernest Adams and Samuel Messick.

Technical rept no. 12 on Contract Nonr-225(17).
9 Sep 57, 51p. 27 refs.
Order from LC mi$3.60, ph$9.30 PB 135 893

Arizona State Coll., Tempe.
ATTITUDES ESTABLISHED BY CLASSICAL CONDITIONING, by Arthur W. Staats and Carolyn K. Staats. Technical rept. no. 1 on Psychological Processes in Language Communication, Contract Nonr-2305(00). [1957] 13p. 11 refs.
Order from LC mi$2.40, ph$3.30 PB 138 918

The purpose of the present study is to test the hypothesis that attitudes already elicited by socially significant verbal stimuli can be changed through classical conditioning, using other words as unconditioned stimuli.

[Behavior Research Lab., Washington U., St. Louis, Mo.]
THE EFFECTS OF MASSED AND SPACED ELECTROCONVULSIVE SHOCK ON CONFLICT BEHAVIOR IN THE MALE ALBINO RAT, by Gertrude J. Williams. Rept. for Jan-June 58 on Contract Nonr-816(06). June 58, 18p.
Order from LC mi$2.40, ph$3.30 PB 140 182

The current investigation was undertaken in order to test the following general hypotheses: (1) A series of convulsions will increase unlearned emotional behavior and attenuate learned emotional behavior. (2) Some of the findings for the classically conditioned emotional response can be generalized to an instrumentally conditioned emotional response. (3) Spaced ECS exerts more striking changes in emotional behavior than massed ECS.

Bureau of Research and Service, U. of Illinois, Urbana.
SIMILARITY BETWEEN PERSONS AND RELATED PROBLEMS OF PROFILE ANALYSIS, by Lee J. Cronbach and Goldine C. Gleser. Technical rept. no. 2 on Contract N6ori-071(35). Apr 52, 53p. 35 refs. ATI-149 802
Order from LC mi$3.60, ph$9.30 PB 133 058

Studies of personality and behavior are turning increasingly to a simultaneous consideration of several traits or characteristics, and a great many investigations attempt to deal with profiles or patterns of scores. In this paper we bring together the procedures which may be used for describing relations between such patterns of multiple scores. A comparison of these possible treatments leads to recommendations for improved procedures in future investigations of similarity between persons.

City College of New York, N. Y.
SELECTED VARIABLES ASSOCIATED WITH ACCEPTANCE OF A NEW SECONDARY GROUP AS A REFERENCE GROUP, by Ruth E. Hartley. Technical rept. no. 5 (Annual) on The Acceptance of New Reference Groups, Contract Nonr-1597(01). 15 Nov 57, 42p. 25 refs.
Order from LC mi$3.30, ph$7.80 PB 136 702

The data reported here were gathered as part of a systematic exploration of variables that might be associated with the acceptance of a large, new, nominal membership group as a reference group. A secondary group (rather than a smaller and more intimate primary group) was chosen as the focus of this investigation because secondary groups are as likely as primary groups to be the pragmatic objects and beneficiaries of reference group feelings in large and complex societies such as our own, and from a societal point of view it is the individual's response to his secondary groups that is often critical in determining the quality of his relevant behavior.

Institute for Research in Human Relations, Philadelphia, Pa.
LEADERSHIP: A REVIEW AND SUMMARY. STATUS, AUTHORITARIANISM AND SOCIOMETRIC CHOICE, by Douglas Courtney, F. Loyal Greer and others. Rept. on Contract Nonr-1229(00). Feb 54, 43p. 36 refs. Series 1954, Inst. rept. no. 3; AD-27 631.
Order from LC mi$3.30, ph$7.80 PB 129 899

Real life situations have been chosen for study as opposed to laboratory experiments. The research has ranged from interviews with representative followers and leaders in the Philadelphia area to the determination of the effects of leadership on the performance of infantry rifle squads carrying out simulated combat missions. This paper presents data on the problem of why some individuals are better liked or more accepted than others in a structured group situation. The two studies reported here specifically deal with military groups, but the results should be applicable to any "natural" or "real life" group situation where a hierarchical arrangement of power, prestige, authority, and status exists; where the individual lives face-to-face with other group members for a considerable portion of every day; and where maintenance of satisfactory group membership is functionally important to the individual.

Laboratory of Social Relations, Harvard U., Cambridge, Mass.
DIFFERENTIATION OF SOCIOMETRIC CHOICE AND ITS IMPLICATIONS FOR STATUS RELATIONS IN A GROUP, (REVISED), by Renato Tagiuri, Nathan Kogan, and Lewis M. K. Long (U. of Arkansas) Rept. on Contract N5ori-076(70). Feb 58, 13p.
Order from LC mi$2.40, ph$3.30 PB 139 907

The present paper will examine the distinction made possible among choices, when the perception or feeling of being chosen is built into the sociometric procedure (6). Where positive feelings only are considered, a subject may (a) choose and feel chosen by a specific other person, (b) choose but not feel chosen, and (c) feel chosen without choosing. The study shows that there is a relationship between these various combinations of choice and perception of choice, on the one hand, and the sociometric status of the person selected, on the other.

Princeton U., N. J.
MATHEMATICAL SOLUTIONS FOR PSYCHOLOGICAL PROBLEMS, by Harold Gulliksen. Technical rept. on Contract Nonr-1858(15). June 58, 56p.

90 refs. In cooperation with Educational Testing Service.
Order from LC mi$3.60, ph$9.30 PB 139 870

An attempt is made to show the value of the mathematico-deductive approach to various psychological problems, and in particular to indicate the very general applicability of two techniques: (1) the usefulness of matrix algebra for expressing a large number of psychological theories and for comparing the theory (observation equations) with data; and (2) the generality of multidimensional scaling as an approach to a variety of psychological problems. The discussion of each illustrative problem stresses the close tie between the mathematical statement and the psychological statement. For every variation in psychological assumptions there must be a matching variation in the mathematical equations. When psychological theories are translated into mathematical equations the mathematician can give the psychologist powerful tools for deriving the implications of his assumptions and for testing their correspondence with data.

Psychological Research Associates, Arlington, Va.
A FRAMEWORK FOR INTEGRATION OF SMALL GROUP RESEARCH STUDIES. A PILOT STUDY, by Joseph E. McGrath. Rept on Contract AF 49(638)47. Oct 57, 255p. 1279 refs. PRA rept. 57-20; AFOSR TR-57-87; AD-136 680.
Order from LC mi$11.00, ph$38.60 PB 135 595

A pilot study is presented relative to the development of a tentative framework for integration of small group research knowledge, and the application of this framework to a sample of studies. A working bibliography of 1279 items is compiled. The classification procedures are discussed which are applied to annotating the bibliography of the developmental sample. Two classification systems at 2 levels of abstraction are described; a syntactical framework for classification of studies by types, and a set of procedures for compiling research information within studies of a given type. Summaries are given of the studies of the developmental sample.

Radiobiological Lab., U. of Texas, Austin.
"ABSOLUTE" VERSUS "RELATIONAL" DISCRIMINATION OF INTERMEDIATE-SIZE IN THE RHESUS MONKEY, by W. Lynn Brown, John E. Overall, and George Gentry. Jan 59, 6p. 4 refs. AFSAM 59-12.
Order from LC mi$1.80, ph$1.80 PB 139 836

Nine rhesus monkeys were successively trained and tested on two intermediate-size transposition problems. In problem I responses based on "relative" stimulus properties were opposed to chance behavior determined by "absolute" stimulus properties, and the subjects indicated significant learning of stimulus relationships. Problem II was designed in such a way that different nonchance behaviors should result from response to "absolute" and "relational" stimulus properties, and the subjects consistently reverted to choices based on "absolute" stimulus properties. It is concluded that rhesus monkeys learn both "absolute" and "relational" cues during training in a single stimulus-situation and that there is a strong tendency to respond to "absolute" stimulus values whenever feasible.

Radiobiological Lab., U. of Texas, Austin.
LEARNING OF SEQUENTIAL RESPONSE ALTERNATIONS BY ALBINO RATS, by James E. Wicker, John E. Overall, and W. Lynn Brown. Dec 58, 5p. 7 refs. AFSAM 58-146.
Order from LC mi$1.80, ph$1.80 PB 139 888

Six albino rats were trained in a modified Skinner box with two response levers located symmetrically on each side of the place of reward. The apparatus was wired to deliver water reward following each alternation between the two response levers and to deliver no reward for perseverative responses to the same lever. The alternation of responses between the two levers increased significantly as a function of training and the final level of response alternation was significantly above chance. Response alternation in this problem is recognized to differ from the spontaneous alternation behavior described in many other experiments because it started at a low level and increased significantly with training. These results are attributed to learning of the alternation reinforcement pattern by the rats.

Radiobiological Lab., U. of Texas, Austin.
NOVELTY LEARNING SETS IN RHESUS MONKEYS, by W. Lynn Brown, John E. Overall, and H. C. Blodgett. Nov 58, 5p. 2 refs. AFSAM 58-147.
Order from LC mi$1.80, ph$1.80 PB 139 887

Thirty-three rhesus monkeys — 7 normal, 13 given low-dose radiation, and 13 given high-dose radiation — were presented with 12 object-quality discrimination problems each day for 16 days. Four trials were allowed on each problem. Each problem involved one new or novel stimulus and one stimulus which had appeared in the preceding problem. Half the time, the stimulus brought forward had been positive (rewarded) and half the time negative (nonrewarded) in the preceding problem. In each problem, the new or novel stimulus was made positive (rewarded) and the stimulus retained from the preceding problem, regardless of previous sign, became negative. The monkeys attained significant first-trial solution of the successive problems. Previous exposure to whole-body radiation did not produce significant differences in performance in this experiment. A significantly greater likelihood of error resulted when the positive stimulus was retained with reversed sign than when the negative stimulus was retained without reversed sign. The relative difficulty of the positive-brought-forward with reversal and the negative-brought-forward without reversal was found to depend on the degree of training.

Radiobiological Lab., U. of Texas, Austin.
TRANSPOSITION OF RESPONSE TO THE INTERMEDIATE-SIZE STIMULUS IN RHESUS MONKEYS, by George Gentry, John E. Overall, and W. Lynn Brown. Jan 59, 4p. 4 refs. AFSAM 59-11.
Order from LC mi$1.80, ph$1.80 PB 139 837

Eight rhesus monkeys were trained to choose the intermediate of three different size stimuli. During transposition testing, stimuli were employed which favored no single choice based on "absolute" stimulus values. When response eliciting values dependent on "absolute" stimulus properties were balanced in this manner, sophisticated rhesus monkeys were observed to base responses on "relational" properties of the test stimuli.

Research Center for Group Dynamics, U. of Michigan, Ann Arbor.
ANNUAL REPORT, NOVEMBER 15, 1956-NOVEMBER 15, 1957. Rept. on Contract Nonr-1224(11). 15 Nov 57, 48p.
Order from LC mi$3.30, ph$7.80 PB 136 703

This report presents the work done by the Research Center for Group Dynamics of the Institute for Social Research, University of Michigan during the period from November 15, 1956 through November 15, 1957. The work is divided into two series of projects on (a) power and influence and (b) group membership and conformity behavior.

Washington U., St. Louis, Mo.
ATTENTION: A BIBLIOGRAPHY AND CLASSIFICATION OF THE PSYCHOLOGICAL LITERATURE, by G. L. Kreezer, J. H. Hill, and Winton Manning. Rept. on Contract AF 33(616)135. Aug 54, 51p. 543 refs. WADC Technical rept. 54-455; AD-57 821.
Order from LC mi$3.60, ph$9.30 PB 129 635

The following bibliography of 543 titles is based on a survey of the psychological literature extending up to July 1954. The date of the earliest reference included is 1873. A classification of titles in relation to 37 subtopics in the area of attention follows the bibliography. This survey was undertaken as a basis for associated experimental studies of methods for measuring attention-demand value and experiments to determine the attention-demand value of a representative series of different kinds of stimuli.

Washington U., Seattle.
THE CONTRIBUTION OF INTEREST TEST SCORES TO DIFFERENTIAL ACADEMIC PREDICTION, by Glen Emil Maier. Rept. on Contract Nonr-477(08). Aug 57, 156p. 81 refs.
Order from LC mi$7.50, ph$24.30 PB 135 926

Improved programs of student guidance, founded upon better manpower information and better methods of appraising an individual's aptitudes will enable more young people to make choices which are best for them, and for the nation, and thus constitute an important element in a total effort to secure better use of the nation's intellectual resources.

BIOLOGICAL SCIENCES

Army Chemical Warfare Labs., Army Chemical Center, Md.
TOXICITY OF PERCHLORYL FLUORIDE, by E. Greene, R. Brough and others. Interim rept. 20 Jan 58, 7p. 6 refs. CWL Technical memo. 26-5.
Order from LC mi$1.80, ph$1.80 PB 139 881

These studies were to determine the toxic effects resulting from single and repeated exposures of various animal species to perchloryl fluoride gas (ClO_3F). Repeated exposure to 200 ppm ClO_3F produced toxic effects and even 40 ppm produced histopathologic changes.

Scripps Institution of Oceanography, U. of California, San Diego.
NON-VISUAL ORIENTATION OF FISH, by Theodore J. Walker. Progress rept. for 1 Jan-31 Dec 56 on Contract Nonr-233(15). May 57, 5p. SIO Ref. 57-23; AD-133 358.
Order from LC mi$1.80, ph$1.80 PB 135 481

The lateral-line system of fish was examined anatomically and found to be made up of detecting units in direct contact with the medium and of detecting units housed in a capillary tube. The system consists of many units which interconnect. Successful resolution of the nerve-ending differentiation resulted from over 100 trials of fixatives. Greater reliability of the nerve-staining process resulted also. Nerve endings were traced to their terminations. Their structure was confirmed by methylene-blue techniques on fresh material. Testing of the acoustic function of the lateral line showed a marked sensitivity of fish to alterations in the sound field produced by air-filled compliant tubes. Conditioned testing of this phenomenon was started by making use of a satisfactory cue-free presentation. Additional similar conditioned testing was started, employing a shaking-table technique for velocity-induced stimulation and a piston-phone calibration tank for pressure stimuli. Nerve-blocking experiments involving various anaesthetics produced marked impairment of lateral-line function.

Texas U. Medical Branch, Galveston.
THE PROPAGATION OF DUCK HEPATITIS VIRUS IN TISSUE CULTURE, by Morris Pollard and Theodore J. Starr. Jan 59, 4p. 9 refs. AFSAM rept. 58-114.
Order from LC mi$1.80, ph$1.80 PB 140 069

Duck hepatitis virus (DHV) has been propagated in tissue culture explants of chick embryos. The propagation of DHV through 10 serial passages was not associated with distinct cytopathology. Replication of virus was less in nutrient-depleted tissues than in those in a complete medium.

Woods Hole Oceanographic Institution, Mass.
QUANTITATIVE RECORDS OF THE LUMINESCENT FLASHING OF OCEANIC ANIMALS AT GREAT DEPTHS, by George L. Clarke. Technical rept. on Contract Nonr-1720(00). June 58, 23p. 20 refs. Reference no. 58-32.
Order from LC mi$2.70, ph$4.80 PB 139 892

Graphical records were obtained of the intensity, duration, and frequency of flashes of luminescent animals at stations in the slope water SE of New York at depths as great as 3750 m (about 2 1/3 miles). The nature of the vertical distribution of animal populations, as suggested by the variation in flashing, is compared with information derived from other types of observations. The brightness and varied pattern of bioluminescence is discussed in relation to the ecology of the deep sea.

Anatomy and Physiology

Aero Medical Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
THE EFFECT OF FOREWARD ACCELERATION ON VITAL CAPACITY, by Fred W. Zechman, Jr. (Miami U.) Rept. on Biophysics of Acceleration. Dec 58, 11p. 9 refs. WADC Technical note 58-376; AD-209 411.
Order from OTS $0.50 PB 151 690

The effect of forward acceleration on vital capacity has been measured in six human subjects. Vital capacities were reduced in a fairly uniform manner with increasing g. Values reached an average of 1.5 liters at 8g when the trunk was inclined 25° forward. This degree of reduction was reached at 6g when the trunk was not inclined.

Aero Medical Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
EFFECT OF PROLONGED ACCELERATION ON THE HUMAN BODY IN THE PRONE AND SUPINE POSITIONS, by E. R. Ballinger and C. A. Dempsey. July 52, declassified 22 Apr 58, 22p. 4 refs. WADC Technical rept. 52-250; AD-5352.
Order from LC mi$2.70, ph$4.80 PB 139 732

Two acceleration problems of equal interest were studied simultaneously. Data were obtained in regard to both the evaluation of the prone bed at various accelerations and the concomitant determination of the physiological tolerance to prolonged periods of acceleration in semi-prone and supine positions. The duration of runs depended upon the acceleration, ranging from 15 minutes at 3 g, 8 minutes at 4 g, etc. to 2 minutes at 10 g. There was no appreciable difference in tolerance in the semi-prone or supine positions with accelerations up to 10 g. However, the necessity for a well-constructed bed and head-supporting helmet, primarily for the comfort of the subject, was repeatedly demonstrated. In properly designed prone and supine beds, 23 unprotected subjects were able to tolerate accelerations up to 10 g for 2 minutes with only a small amount of discomfort.

Aeromedical and Physical Environment Lab., U. of Illinois, Urbana.
ALTITUDE STRESS IN SUBJECTS WITH IMPAIRED CARDIORESPIRATORY FUNCTION. C: STUDIES ON PATIENTS WITH ANEMIA, by John P. Marbarger, Gordon F. Vawter and others. Jan 53, 27p. 13 refs. AFSAM Proj. no. 21-23-019, rept. no. 3.
Order from LC mi$2.70, ph$4.80 PB 135 465

Cardiac output promptly increased with inhalation of ambient air at the reduced barometric pressure existing at 10,000 feet and continued to increase up to values 82 percent above ground level control readings during a period of 20 minutes breathing ambient air at 18,000 feet. The increase in cardiac output was occasioned by an increase in pulse rate which tended to stabilize with continued hypoxia and by a marked increase in stroke volume which progressively increased as the period of hypoxia continued. Total effective peripheral resistance to blood flow decreased upon exposure to ambient air inhalation at simulated altitudes up to 18,000 feet. "Useful work of the left ventricle" markedly increased with exposure to 10,000 feet and further increased at 18,000 feet breathing ambient air up to 70 percent above ground level control values. Oxygen carriage increased 20 percent above ground level control values at 10,000 feet after 10 minutes and was maintained at this value throughout the test. Mean venous pressure increased progressively as the period of hypoxia continued. The anemic patients withstood the hypoxic exposure very well and within 5 minutes after 100 percent oxygen was administered, all records had returned to ground level control values.

Army Chemical Warfare Labs., Army Chemical Center, Md.
DEAD SPACES OF THE M9A1 AND E13R9 PROTECTIVE MASKS, by E. G. Cummings and F. N. Craig. Dec 58, 24p. 12 refs. CWLR-2264.
Order from LC mi$2.70, ph$4.80 PB 139 879

A method for measuring gas mask dead space by continuous sampling of CO_2 is described. The dead spaces of the M9A1 and E13R9 protective masks are described in terms of total or potential dead space and effective or actual dead space while breathing is being carried on. The total dead space is 0.50 l. for the E13R9 and 0.35 l. for the M9A1. The effective dead spaces of both masks were variable, depending on facial contours, position of mask, rate of breathing, and at tidal volumes above 1 liter were not restricted to the nosecup volume. The effective dead space of the E13R9 was greater than that of M9A1 and it was concluded that due to the design of the mask the nosecup was not as effective. However, the additional CO_2 rebreathed from either mask was not enough to influence performance. The greater effective dead space of the E13R9 may account in part for the greater tendency of the lenses to fog in cold weather. The amount of water vapor being carried to the lens area is approximated from the data.

Army Chemical Warfare Labs., Army Chemical Center, Md.
THE EFFECT OF PROTECTIVE MASKS ON THE SOLDIER'S ABILITY TO RUN A HALF MILE, by E. G. Cummings, W. V. Blevins and others. Oct 58, 20p. 6 refs. CWLR-2254.
Order from LC mi$2.40, ph$3.30 PB 139 880

Half-mile speed running indicative of performance in tasks, such as assault maneuvers were performed using paratroopers wearing M9A1 and E13R9 gas masks. Paratroopers also ran with no mask and with masks having the filter material removed. Running times, per cent increase in running time, final heart rates and the statistical analysis of data are given. The effect of mask-weight distribution, inspiratory resistance, and visual field on running is discussed.

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
ADAPTATION TO POSITIVE ACCELERATION, by J. W. Fraser and Elizabeth Reeves. Rept. no. 4 on Proj. NM 11 01 12.3. 23 Dec 58, 19p. 3 refs. NADC-

MA-5818.
Order from LC mi$2.40, ph$3.30 PB 139 877

One hundred and fifty male Sprague-Dawley rats, weighing ca 250 grams, were subjected to positive acceleration. Fifty were preconditioned by exposure to 2 G, 50 to 12G, 50 to cage stressing 1/2-hour a day for 6 weeks. At the end of the conditioning period all animals were subjected to 20 G and their survival time was measured by means of a transistor EKG. Rats preconditioned to 12 G had significantly longer survival times, rats exposed to 2 G significantly shorter survival times than cage-stressed controls. Statistical correction was made for losses in the group preconditioned at 12 G. Mean survival times at 20 G for cage-stressed controls were 1218 seconds, 2 G preconditioned 969 seconds, 12 G preconditioned 2011 seconds.

Franklin Inst. Labs. for Research and Development, Philadelphia, Pa.
VISUAL SEARCH IN AN UNSTRUCTURED VISUAL FIELD, by Ezra S. Krendel and Jerome Wodinsky. Final rept. for 1 July 55-30 June 58 on Contract AF 19(604)1513. [1959] 52p. 6 refs. Rept. no. F-A1851; AFCRC TR-59-51; AD-211 156.
Order from LC mi$3.60, ph$9.30 PB 140 052

Binocular visual search in an unstructured field has been studied. The adequacy of an exponential distribution function to describe the detection probabilities in visual search has been demonstrated. Cumulative distribution functions for visual search have been measured for the following parameters: background luminance, size of search field, target size and contrast. In the major experiment, 3072 trials for each of four practiced observers supplied the basic data for this report.

Institute of Andean Biology, Lima (Peru).
BASAL METABOLIC RATE, BODY COMPOSITION, AND CREATININE EXCRETION AT HIGH ALTITUDES, by Emilio Picón-Reátegui. Nov 58, 11p. 29 refs. AFSAM 58-97.
Order from LC mi$2.40, ph$3.30 PB 139 890

The study was carried out in an attempt to set up a standard of reference which would be more closely correlated with the BMR and to compare also findings on the relationship between BMR, creatinine excretions, and body composition in residents of high altitude with those of other investigators.

Institute of Andean Biology, Lima (Peru).
COMPARATIVE STUDY OF ADRENAL FUNCTION AT SEA LEVEL AND AT HIGH ALTITUDE: THE RESPONSE TO ACTH, by Carlos Subauste, Ruth Aliaga and others. Sep 58, 16p. 57 refs. AFSAM 58-95.
Order from LC mi$2.40, ph$3.30 PB 139 891

Data obtained suggest the following conclusions: (1) The baseline studies showed that excretion of 17-ketosteroids is lower in the natives of high altitude than in men living at sea level. Differences in the basal excretion of 17-hydroxycorticosteroids were not significant. (2) With the ACTH dosage used in this study, the responses in the excretion of 17-ketosteroids and 17-hydroxycorticosteroids and in the fall of eosinophils are less in natives of high altitude than in men living at sea level. (3) The lesser degree of response at high altitude, and perhaps lower sensitivity of the adrenals to ACTH, could be explained by the chronic hypoxia and the consequent decrease in the oxygen supply to the adrenal tissue. (4) Since a previous investigation, in which 25 I. U. of ACTH were used, showed no significant difference, we conclude that under administration of larger doses of ACTH the adrenals of subjects living at high altitude, although less sensitive to the drug, are able to produce a maximal response similar to the one obtained in residents of sea level.

Psycho-Acoustic Lab., Harvard U., Cambridge.
PERIODIC STATUS REPORT XXX, by S. S. Stevens, E. B. Newman and others. Rept. for 16 May-15 Nov 57 on Contract Nonr-1866(15). 15 Nov 57, 59 refs. PNM-78.
Order from LC mi$2.40, ph$3.30 PB 136 697

Quartermaster Research and Engineering Center, Natick, Mass.
ANTHROPOMETRIC AND BIOMECHANICAL CHARACTERISTICS OF THE HAND, by C. E. Jones, J. L. Kobrick, and H. F. Gaydos. Sep 58, 21p. 14 refs. Technical rept. EP-100.
Order from LC mi$2.70, ph$4.80 PB 137 901

Descriptive data are presented on the structural and functional characteristics of the human hand which are of interest to engineers concerned with the design of handwear and manually-operated equipment. The first section deals with the anthropometric dimensions of the hand, and shows the centile distribution of component hand sizes in several military population samples. The second section reviews data on the biomechanics of the hand in terms of direction, range, and forces involved in typical functional movements.

Quartermaster Research and Engineering Center, Natick, Mass.
THEORETICAL MODEL FOR DESERT HEAT TOLERANCE, by Paul T. Baker. July 58, 33p. 37 refs. Technical rept. EP-96.
Order from LC mi$3.00, ph$6.30 PB 135 853

Experimental and acturial data indicate that there is a high degree of individual variance in ability to tolerate hot desert conditions. The same data also show that a significant percentage of this variance is correlated to morphological characteristics. From these relationships a "model" was constructed. The model or "ideal" man for tolerance of desert heat was found to be linear, low in subcutaneous body fat, acclimatized, and of brunette skin color.

School of Aviation Medicine, Randolph AFB, Tex.
THE EFFECT OF THYROID HORMONES AND TEMPERATURE ON THE KINETICS OF CONTRACTION AND RELAXATION OF VENTRICULAR HEART MUSCLE, by William R. Brewster, James P.

Isaacs and others. Nov 58, 22p. 61 refs. Rept. 58-140.
Order from LC mi$2.70, ph$4.80 PB 140 071

The kinetics of isometric contraction and relaxation have been observed in intact athyroid, euthyroid, and thyroid-fed dogs, utilizing Walton strain gage arches sutured to segments of both right and left ventricular heart muscle. The animal's heart and body temperatures were varied from 42° to 17° C. Isometric contraction and relaxation of muscle displayed four distinct phases for analysis: (1) initial contraction characterized by a rapid and near maximal increase in tension, (2) contracted state during which a further slow increase in tension may occur, (3) relaxation, and (4) relaxed state. The temperature coefficients (Q_{10}) and Arrhenius activation energy (μ) values were calculated for the duration of the above-named states, for the tensions developed, and for the oxygen consumption in ml./m.^{2}/min. The Q_{10} values for the duration of the phase of initial contraction and for the tension developed varied from 1.09 to 1.38, with (μ) values of 2,600 calories to 6,040 calories. In contrast, the duration of the contracted state and the time required for isometric relaxation had Q_{10} values varying from 2.7 to 3.4, and (μ) values of 18,390 to 22,100 cal./mole. A linear, inverse, exponential relationship existed between the metabolic rate and either the duration of the contracted state or the time required for relaxation. Contraction possesses the characteristic of a physical process involving ionic interaction, diffusion, or viscous flow. Relaxation has the kinetic characteristics of an enzymatic reaction associated with and dependent upon chemical bond energy or electron transfer. Relaxation of ventricular heart muscle thus has the characteristics of an active metabolic process, its rate related directly to thyroid hormone activity and temperature.

School of Aviation Medicine, Randolph AFB, Tex.
INFLUENCE OF LONG-TERM EXPOSURE TO ADVERSE ENVIRONMENTS ON ORGAN WEIGHTS AND HISTOLOGY, by Henry B. Hale, Roy B. Mefferd, Jr. (Clayton Foundation Biochemical Inst.) and others. Jan 59, 9p. 11 refs. Rept. 59-13.
Order from LC mi$1.80, ph$1.80 PB 139 835

A comparison was made of the morphologic effects of cold, heat, and simulated altitude on adult male rats given exposures of 24 weeks' duration. By the use of covariance analysis it was possible to determine the extent to which organ weights were dependent on body weight and to adjust the values in order to remove influences of body weight. For liver, heart, and kidney, adjusted weights indicated temperature-dependency, while pressure-dependency was established for liver and kidney only. Histologically, temperature-dependency was indicated for liver, kidney, thyroid, adrenal, and pituitary. Fur weight was reduced in heat but not altered in cold. Fasting in cold induced changes in adrenal and thymus weight and unusually high body weight loss; in heat, fasting caused a significant thymus weight loss without adrenal weight increase. The thymus-adrenal ratio was elevated during a 24-hour fast in all environments except cold, where it was decreased.

School of Aviation Medicine, Randolph AFB, Tex.
MODIFICATIONS OF THE REDDY METHOD FOR THE ESTIMATION OF 17-HYDROXYCORTICOIDS IN BLOOD, by John R. Prigmore, Ira L. Shannon, and Ralph P. Feller. Jan 59, 9p. 8 refs. Rept. 59-24.
Order from LC mi$1.80, ph$1.80 PB 139 839

A procedure evolved from modifications of existing technics for the estimation of total 17 hydroxycorticoids in blood has been described. Data are also presented on the precision of the method, recoveries of added hydrocortisone, and values obtained in a series of young adult males.

School of Aviation Medicine, Randolph [AFB], Tex.
PHYSIOLOGICAL RECOGNITION OF STRAIN IN FLYING PERSONNEL. II B-29 training mission, by Thaddeus J. Domanski and James B. Nuttall. Apr 52, 21p. 2 refs. Proj. no. 21-32-030, rept. no. 2.
Order from LC mi$2.70, ph$4.80 PB 135 460

Pre- and post-mission eosinophil studies were made on student personnel of the phase portion of the B-29 combat crew training program at Randolph Air Force Base. The subjects studied were the aircraft commander, navigator, flight engineer, radar observer, and radio operator. Each mission included approximately 3 hours of pre-flight flightline activities, an 8- to 14-hour flight, and approximately 1/2 hour of post-flight flightline activities. Observations relative to the eosinophil response associated with B-29 aircraft accidents are presented and discussed. Only a decrease in blood eosinophil count of approximately 40 percent or more was associated with recognizable events or circumstances consistent with the existence of a state of psychological stress for the aircrew personnel studied.

School of Aviation Medicine, Randolph [AFB] Tex.
PHYSIOLOGICAL RECOGNITION OF STRAIN IN FLYING PERSONNEL: EOSINOPENIA IN F-84 TRAINING OPERATIONS, by Thaddeus J. Domanski. Mar 53, 16p. 2 refs. Proj. no. 21-1208-0005, rept. no. 1.
Order from LC mi$2.40, ph$3.30 PB 135 467

Recognizable events and circumstances occurring in the course of F-84 training operations at Luke AFB were associated with significant differences in blood eosinophil response. These data provide additional support for the emergent relationship between subjective phenomena and blood eosinophil response.

School of Aviation Medicine, Randolph AFB, Tex.
PLASMA CORTICOSTEROID LEVELS IN AIRCREWMEN AFTER LONG FLIGHTS, by Henry B. Hale, Clyde H. Kratochvil, and James P. Ellis, Jr. Dec 58, 4p. 9 refs. Rept. 59-15.
Order from LC mi$1.80, ph$1.80 PB 139 840

The fluorescence method of Sweat for the determination of hydrocortisone and a corticosteronelike fraction in blood was utilized in an attempt to evaluate flying fatigue in a group of 44 aircrewmen participating in flying activities in military aircraft. Preflight values for each of the two steroid fractions agreed with those of Sweat for normal male subjects, but significant in-

creases in both fractions were noted after flights of 9 to 12 hours duration. These changes are not of the nature of normal diurnal variations.

School of Aviation Medicine, Randolph AFB, Tex.
THE PROVISION OF RESPIRATORY GAS EXCHANGE FOR SMALL PRIMATES BY USE OF A PHOTOSYNTHETIC EXCHANGER, by Robert D. Gafford, H. L. Bitter, and Robert M. Adams. Oct 58, 6p. 2 refs. Rept. 58-126.
Order from LC mi$1.80, ph$1.80 PB 137 984

The experiments reported here were designed to determine to what extent the existing photosynthetic gas exchanger is capable of satisfying the respiratory requirements of a 3-kg. primate. The results of these experiments can be used to assess the "demand phenomenon" previously observed in experiments with mice, and to establish design criteria for larger photosynthetic gas exchangers.

School of Aviation Medicine, Randolph [AFB] Tex.
SPEAKING EFFICIENCY OF FLIERS WITH LARYNGEAL PARALYSIS: DEVELOPMENT OF A ROUTINE TEST METHOD, by Reed W. Hyde and Juergen Tonndorf. Mar 53, 12p. 4 refs. Proj. no. 21-1203-0001, rept. no. 2.
Order from LC mi$2.40, ph$3.30 PB 135 471

Standard techniques have been applied and a test procedure is described for the practical evaluation of the effects of laryngeal paralysis on intelligibility of the speech under various conditions of flying. Special emphasis is placed upon intelligibility as it is affected by the presence of aircraft noise. Two fliers with laryngeal paralysis were evaluated in this manner, and the results compared to those of a small control group of normal speakers. The procedure may be applied, with modifications, in the evaluation of other lesions which might affect speech intelligibility To study differences between speakers, tests should be chosen which, in general, result in low articulation scores, because in sucn tests differences between speakers become more readily apparent. Other speakers may subsequently be compared to this standard group; subjects who cannot be submitted to changes in altitude may be evaluated by use of the three sea-level tests. A small panel of trained listeners is all that is required.

University Hospitals, Iowa City.
LOCALIZATION OF AURAL HARMONICS ALONG THE BASILAR MEMBRANE OF GUINEA PIGS, by Juergen Torndorf. Nov 58, 12p. 18 refs. AFSAM rept. 58-129.
Order from LC mi$2.40, ph$3.30 PB 140 070

Harmonic distortion has been shown to originate hydrodynamically in cochlear models, its essential cause being Bekesy's "eddies" and their sequelae. One of the major postulates derived from this study was that the distortion be resolved along the cochlear partition in accordance with the place principle of frequency localization. Experiments on guinea pigs were conducted in an effort to support this latter postulate. A method of recording cochlear microphonics by means of differential electrodes was chosen. This method had been previously used by Tasaki, Davis, and Legouix for mapping amplitude and phase alteration along the basilar membrane. The results of the present study indicate: (1) that distortion within the cochlea occurs at a lower level than it does in the middle ear (confirming results of earlier investigators); and (2) that each newly created harmonic forms a traveling-wave pattern of its own along the basilar membrane in accordance with the place principle. These results support the hydrodynamic hypothesis of the origin of intracochlear distortion.

Biochemistry

Oklahoma State U. Research Foundation, Stillwater.
REACTION OF CYSTINE WITH SODIUM SULFIDE IN SODIUM HYDROXIDE SOLUTION, by George Gorin and Gollamudi S. Rao. Rept. on Studies on Urease, Contract AF 18(603)135. July 58, 15p. 14 refs. AFOSR TN-58-519; AD-158 332.
Order from LC mi$2.40, ph$3.30 PB 135 410

Oklahoma State U. Research Foundation, Stillwater.
STUDIES ON UREASE. I. THE HYDROLYSIS OF AMMONIUM CARBAMATE AND THE MECHANISM OF ACTION OF UREASE, by George Gorin. Rept. on Contract AF 18(603)135. July 58, 11p. 11 refs. AFOSR TN-58-518; AD-158 331.
Order from LC mi$2.40, ph$3.30 PB 135 411

Botany

Pacific Science Board, National Research Council, Washington, D. C.
THE FLORA OF ONOTOA ATOLL, GILBERT ISLANDS: PRELIMINARY REPORT, by Edwin T. Moul (Rutgers U.). Rept. on Contract N7onr-291(54). June 57, 49p. Scientific Investigations in Micronesia rept. no. 24.
Order from LC mi$3.30, ph$7.80 PB 137 684

School of Aviation Medicine, Randolph AFB, Tex.
RING CLOSURE AND FUNGISTATIC ACTIVITY, by Alfred A. Renzi, Anna C. Garner, and Alfred Burger (U. of Virginia). Nov 57, 6p. 5 refs. Rept. 58-25.
Order from LC mi$1.80, ph$1.80 PB 135 864

Seventeen phenothiazine derivatives and 21 phenothiazine-like compounds with the middle ring open at position 10 were tested. An index number was assigned to each compound as a grading scale for fungistatic activity. The more active compounds of both groups were only half as effective as isoquinolinium derivatives which are know fungistatic agents. Evaluation of the closed-ring compounds tested revealed that the length of the side chain attached to the middle ring was a determining factor in inhibiting fungal growth. The

presence of chlorine had little or no effect. The inactivity displayed by the majority of these compounds was attributed to the presence of oxygen in the side chain. The opening of the middle ring at position 10 neither enhanced nor inhibited fungistatic activity. The addition of one or more chlorine atoms to the open-ring compounds, however, increased their activity and eliminated the need for a long side chain. Furthermore, the addition of oxygen to the side chain of these open-ring compounds showed little inhibiting effect.

Medical Specialties and Equipment

Chemical Corps Medical Labs., Army Chemical Center, Md.
MASK-TO-MASK VS. HAND BELLOWS DEVICES FOR ARTIFICIAL RESPIRATION, by John A. Clements, James O. Elam, and David B. Dill. Conference rept. Aug 54, 7p. 6 refs. Special rept. no. 479.
Order from LC mi$1.80, ph$1.80 PB 140 006

A presentation of research findings on the subject as given at a conference.

Office of Naval Research, Washington, D. C.
THE DENTAL RESEARCH PROGRAM OF THE DEPARTMENT OF THE NAVY. Surveys of Naval Science no. 6, July 57, 63p. ONR rept. ACR-21; In cooperation with Bureau of Medicine and Surgery.
Order from LC mi$3.90, ph$10.80 PB 138 469

Part I of this survey is concerned with the program in universities and other nonprofit institutions. Part I was abstracted from the most recent Annual Progress Reports which were submitted in January 1957. Part II is the program currently underway in naval laboratories under the cognizance of the Bureau of Medicine and Surgery. Abstracts of papers contained in this part of the survey were presented at the First Annual Naval Dental Research Conference.

Pathology

Brooke Army Medical Center, Fort Sam Houston, Tex.
CARBOHYDRATE METABOLISM IN THERMAL INJURY: INHIBITION OF ANAEROBIC GLYCOLYSIS, by M. K. Young, Jr., Wanda L. Brown, and Leonard G. Seraile. Rept. on Radiation and Thermal Burns. Oct 58, 14p. 8 refs. Research rept. no. 9-58.
Order from LC mi$2.40, ph$3.30 PB 137 850

Decreased conversion of glucose-U-C^{14} to lactic acid in diaphragm incubated in plasma from thermally injured animals was demonstrated. Conversion of glucose-U-C^{14} to lactic acid was also observed in intact animals. Turnover times estimated from the C^{14} activity in lactate indicated a decreased lactic acid turnover in the liver, plasma, and muscle from the uninjured extremities of the thermally injured rats. The lactic acid turnover in the muscle from the burned extremities appeared to be completely inhibited. Chemical assay showed there was a significant decrease in the glycogen level of the muscle of the unburned extremity of the thermally injured animals. There was a significant increase in the C^{14} specific activity of glycogen in the liver of uninjured animals and no significant change in the liver of thermally injured animals. The possibility of circulating substances causing the observed inhibition of glucose uptake in thermal injury is discussed.

Brooke Army Medical Center, Fort Sam Houston, Tex.
THE EFFECT OF HYPOTHERMIA ON INFECTION IN RATS, by Jerome J. DeCosse, Harrel L. Walker, and Russell E. Brame. Rept. on New Drugs and Antibiotics. Aug 58, 11p. 9 refs. Research rept. no. 7-58.
Order from LC mi$2.40, ph$3.30 PB 137 854

The effect of hypothermia in the treatment of experimental Pseudomonas aeruginosa in rats has been tested in paired experiments. The significant reduction in mortality during hypothermia in the animals so treated was nullified during the rewarming phase and subsequent period of observation.

School of Aviation Medicine, Randolph AFB, Tex.
A SYMPOSIUM ON THE PATHOGENESIS OF ATHEROSCLEROSIS. Oct 56, 15p. 17 refs. Rept. 57-35.
Order from LC mi$2.40, ph$3.30 PB 127 659

School of Aviation Medicine, Randolph AFB, Tex.
TOXICOLOGIC STUDIES WITH DIDYMIUM NITRATE AS MODIFIED BY SITE OF INJECTION AND WHOLE-BODY RADIATION, by George S. Melville, Jr., Thomas P. Leffingwell, and Quentin L. Hartwig. Nov 58, 8p. 7 refs. Rept. 59-1.
Order from LC mi$1.80, ph$1.80 PB 139 833

The rare-earth mixture didymium (as the nitrate) was administered to rats intraperitoneally, subcutaneously, and in wound implantation. Mortality and clinical sequelae were observed. When groups of these animals were subjected to 800 r of Co^{60} gamma irradiation, mortality was increased in all treatment groups. This increase was statistically significant in the intraperitoneal experiment and the combined effect appears to be synergistic.

Radiobiology

Army Medical Nutrition Lab., Denver, Colo.
MEDICAL PROTECTION PLAN FOR THE IRRADIATED FOOD TASTE PANEL, by Allan L. Forbes and Mayna R. Allen. 17 June 58, 11p. Rept. 221.
Order from LC mi$2.40, ph$3.30 PB 135 919

A medical protection plan consisting of periodic routine histories, physical examinations, hemograms,

urinalyses, and several liver function tests was inaugurated on 8 April 1954 for the protection of members of the Irradiated Food Taste Panel at the Quartermaster Food and Container Institute Chicago. The program was terminated on 17 March 1958 after all findings on 96 tasters proved negative. Within the limits of the medical data available, no physical or clinical laboratory abnormalities could be attributed to the tasting of irradiated foods.

Army Medical Research Lab., Fort Knox, Ky.
PROTECTION OF SINGLE CELLS AND SMALL CELLS GROUP AGAINST RADIATION, by S. Bellack and A. T. Krebs. Rept. on Studies of Body Reactions and Requirements under Varied Environmental and Climatic Conditions. 10 July 51, 19p. 20 refs. Rept. no. 60.
Order from LC mi$2.40, ph$3.30 PB 140 281

Brown U., Providence, R. I.
EFFECTS ON THE SKIN BY COSMIC RAY HEAVY PARTICLES, by Herman B. Chase, Janet D. M. Bliss and others. Rept. on Contract AF 33(616)2085. May 55, 11p. 5 refs. HADC-TR-55-2.
Order from LC mi$2.40, ph$3.30 PB 139 733

This report presents the results of stratosphere balloon flights as regards the effects on skin and the production of white hairs in mice exposed to cosmic ray heavy primaries. White hairs do occur and frequently in small clusters. Other effects on the skin are difficult to observe, if they occur, and a discussion of the reason for this is presented. The urgent need for ground level studies with skin exposures through small apertures to stripped carbons and other radiations is emphasized.

Duke U., Durham, N. C.
RADIOFREQUENCY SPECTROSCOPY. Status and technical rept. no. 23, 1 Nov 57-1 Feb 58, on Contract DA 36-034-ORD-1233. Mar 58, 104p. 33 refs. AD-137 059.
Order from LC mi$5.70, ph$16.80 PB 135 865

Contents:
Abstracts of current projects:
- Cobalt sixty gamma ray source
- Radiation effects on amino acids
- Radiation effects on peptides

Technical reports:
- Electron spin resonance studies of radiation Damage to amino acids
- Electron spin resonance studies of radiation damage to peptides

Radiobiological Lab., U. of Texas, Austin.
THE EFFECTS OF IONIZING RADIATION UPON THE TRANSPOSITION OF DISCRIMINATION HABITS OF RHESUS MONKEYS, by George Gentry, W. Lynn Brown, and John E. Overall. Nov 58, 6p. 17 refs. AFSAM 58-142.
Order from LC mi$1.80, ph$1.80 PB 139 889

Thirty-three rhesus monkeys, representing five radiation dose levels, were trained on intermediate-size discrimination problems. A test of transposition was employed to determine the extent to which subjects of the different dose groups utilized relationships between the stimuli as a basis for problem solution. Relational learning was found to decrease as a linear function of radiation dosage.

Radiobiological Lab., U. of Texas, Austin.
VISUAL ACUITY PERFORMANCE OF NORMAL AND CHRONIC FOCAL-HEAD IRRADIATED MONKEYS, by A. A. McDowell and W. Lynn Brown. Dec 58, 5p. 3 refs. AFSAM 59-5.
Order from LC mi$1.80, ph$1.80 PB 139 832

Monkeys were tested on each of eight visual acuity problems presented in order of increasing difficulty. The results of the study reflected differences between chronic focal-head irradiated monkeys and normal monkeys with respect to performance on these problems. Most efficient performance was shown by the control animals, intermediate efficiency of performance by the animals with previous focal-head irradiation of the posterior association areas, and least proficient performance by the animals with previous focal-head irradiation of the frontal association areas.

Radiobiological Lab., U. of Texas, Austin.
VISUAL ACUITY PERFORMANCE OF NORMAL AND CHRONIC IRRADIATED MONKEYS, by W. Lynn Brown and A. A. McDowell. Nov 58, 5p. 2 refs. AFSAM 58-149.
Order from LC mi$1.80, ph$1.80 PB 139 834

The results of the present study demonstrated that: (1) The visual acuity deficit noted during the first year after exposure in the high-dose irradiated monkeys (616 rep) was still manifested three years after exposure. (2) Monkeys in the intermediate-dose group (308 rep), that had shown no visual acuity deficit during the first year after exposure, manifested such a deficit three years after exposure. (3) An interpretation of the results in terms of a basic deficit in learning ability for the monkeys of these two groups is contraindicated by their superiority over normal and low-dose irradiated monkeys on the initial and easiest problem.

School of Aviation Medicine, Randolph AFB, Tex.
EFFECT OF REPEATED WHOLE-BODY X-IRRADIATION ON THE PERIPHERAL WHITE BLOOD CELL COUNT OF RABBITS, by Herbert B. Gerstner and Harry A. Gorman. Feb 59, 6p. 6 refs. Rept. 59-52.
Order from LC mi$1.80, ph$1.80 PB 139 838

Statistical analysis of data yielded the following results: In the three exposures, radiation-induced leukopenia showed no significant difference with respect to rate of development, maximal degree, and rate of disappearance. Therefore, as judged by the white blood cell count, susceptibility to ionizing radiation appeared unaltered by previous exposure to appreciable doses when the interval between exposures was sufficiently long to permit complete hematopoietic recovery.

School of Aviation Medicine, Randolph AFB, Tex.
INHIBITION OF POSTIRRADIATION DIURESIS BY VASOPRESSIN IN RATS, by Clyde M. Williams and George M. Krise (Radiobiological Lab.). Preliminary rept. Feb 58, 3p. 13 refs. Rept. 58-77.
Order from LC mi$1.80, ph$1.80 PB 135 583

Virginia U., Charlottesville.
PROCEEDINGS OF THE SECOND TRI-SERVICE CONFERENCE ON BIOLOGICAL EFFECTS OF MICROWAVE ENERGY 8, 9, 10 JULY 1958, by Evan G. Pattishall and Frank W. Banghart. Rept. on Contract AF 18(600)1792. Sep 58, 270p. 8 refs. ARDC-TR-58-54; AD-131 477.
Order from LC mi$11.10, ph$41.10 PB 140 093

The papers represent the contributions of many leaders in the fields of biology, physics, medicine, engineering, and psychology. Every attempt has been made to present the papers for the reader as they were presented at the conference. In some cases additional information has been incorporated into the presentations. The presentations may be useful in summarizing the present knowledge on the biological effects of microwave energy and may be of value as source material for future researchers.

CHEMISTRY

Analytical Chemistry

Ballistic Research Labs., Aberdeen Proving Ground, Md.
POLYSTYRENE-SILICA AND POLYSTYRENE-CARBON REPLICA TECHNIQUE FOR RELOCATING SELECTED AREAS FOR EXAMINATION IN THE ELECTRON MICROSCOPE, by Homer L. Murray. Mar 58, 18p. 8 refs. Rept. no. 1046.
Order from LC mi$2.40, ph$3.30 PB 135 571

A technique for fabricating polystyrene-silica and polystyrene-carbon replicas for repeated examination of selected areas of the specimen in the electron microscope is described in detail. Repetitive electron micrographs of selected areas of these replicas are presented. A simplified method of manipulating the specimen grid is described, as is also a method for eliminating rupture of the silica replicas, when the intermediate polystyrene replica is removed by solution.

Laboratory for Nuclear Science, Mass. Inst. of Tech., Cambridge.
REVIEW OF RECENT APPLICATIONS OF ION EXCHANGERS IN ANALYTICAL CHEMISTRY, by U. Schindewolf. Rept. on Contracts [N5ori-078(06)] and AT(30-1)905. 15 Dec 55, 27p. 57 refs. Technical rept. no. 68.
Order from LC mi$2.70, ph$4.80 PB 140 075

To be published in Zeitschrift für Angewandte Chemie, Heidelberg, 1956.

Massachusetts Inst. of Tech., Cambridge.
POLAR DISPLACEMENT REACTIONS, by C. Gardner Swain. Final rept. for 1 Apr 49-30 Sep 57 on Contract N5ori-078(38). 1 July 58, 5p. 12 refs.
Order from LC mi$1.80, ph$1.80 PB 140 183

Brief summary is given of accomplishments to date. A list is given of papers published and which cover this research in various phases.

Inorganic Chemistry

Illinois U., Urbana.
SOME STUDIES OF THE INTERACTION OF COBALT AND NICKEL WITH TITANIUM DIBORIDE, by Tracy A. Willmore and Dwight G. Bennett. Rept. no. 81 on Contract AF 18(603)28. Apr 58, 51p. 3 refs. AFOSR TN-58-515; AD-158 326.
Order from LC mi$3.60, ph$9.30 PB 135 613

When combinations of cobalt and titanium diboride are heated in the temperature range 1600° to 2750° F, chemical reaction occurs to produce titanium monoboride and cobalt boride. Melting was detectable at temperatures as low as 2000° F. Compacts of nickel and titanium diboride yielded results closely paralleled.

Michigan State U., East Lansing.
THE PRODUCTION OF REDUCED BORON COMPOUNDS AND BORON HYDRIDES, by P. R. Ogle, Jr. Doctoral thesis. June 55, 95p. 50 refs. MCC-1023-TR-174.
Order from LC mi$5.40, ph$15.30 PB 129 470

The electrolytic reduction of n-butyl and n-amyl difluoroboranes in acetonitrile, triethylamine, and tetrahydrofuran was attempted. Reactions of trimethoxyboroxine with sodium and calcium hydrides, sodium and lithium borohydrides, and boron trichloride were studied. Tributoxyboroxine, a new compound, was prepared by reacting diboron trioxide with tri-n-butoxyborane.

Naval Propellant Plant, Indian Head, Md.
DECABORANE GRIGNARD REAGENTS AND THE FORMATION OF SUBSTITUTED DECABORANES, by Bernard Siegel, Julius L. Mack, and John Gallaghan, 15 Aug 58 [18]p. 9 refs. Memo. rept. 152.
Order from OTS $0.50 PB 151 305

Inorganic Grignard reagents are formed when decaborane is reacted with methyl magnesium iodide. Either $B_{10}H_{13}MgI$ or $B_{10}H_{12}(MgI)_2$ can be prepared. The bromide and chloride also form decaborane Grignard reagents. Upon hydrolysis of $B_{10}H_{13}MgI$, decaborane and MgIOH are formed. Benzyl chloride and allyl chloride react with decaborane Grignard reagents to form substituted decaboranes. Benzyl decaborane has been characterized, and the benzyl group was shown by nuclear magnetic resonance studies to be substituted at a basal boron atom. Preliminary evidence indicates that carbon dioxide reacts

with the decaborane Grignard reagent to form a carboxylate salt. One of the products isolated from the benzyl chloride reaction is believed to possess a di-decaboryl linkage.

North Carolina U., Chapel Hill.
THE DONOR PROPERTIES OF $POCl_3$, $SeOCl_2$, CH_3COCl, $SOCl_2$, and $VOCl_3$, by J. C. Sheldon and S. Y. Tyree. Technical rept. no. 4 on The Synthesis of New Inorganic Molecules, Contract Nonr-855(05). 1 July 58, 30p. 31 refs.
Order from LC mi$2.70, ph$4.80 PB 140 260

Freezing point diagrams are reported for the systems $POCl_3$-CCl_4, $POCl_3$-$SiCl_4$, $POCl_3$-$AsCl_3$, $POCl_3$-C_5H_5N, $SeOCl_2$-CCl_4, $SeOCl_2$-$AsCl_3$, $SeOCl_2$-$SnCl_4$, $SeOCl_2$-C_6H_6, CH_3COCl-$SiCl_4$, CH_3COCl-CCl_4, CH_3COCl-$AsCl_3$, CH_3COCl-$SnCl_4$, CH_3COCl-$TiCl_4$, $SOCl_2$-CCl_4, $SOCl_2$-$SiCl_4$, $SOCl_2$-$AsCl_3$, $SOCl_2$-$SnCl_4$, $SOCl_2$-$TiCl_4$, $SOCl_2$-C_5H_5N, $VOCl_3$-$SnCl_4$, and $VOCl_3$-$TiCl_4$. Compounds observed indicate decreasing donor strength in the order $POCl_3$, $SeOCl_2$, CH_3COCl, $SOCl_2$, $VOCl_3$, and decreasing acceptor strength in the order $TiCl_4$, $SnCl_4$, $AsCl_3$, $SiCl_4$, CCl_4. Infra-red spectral studies of the oxychloride-acceptor systems are reported.

Richmond Research Lab., Stauffer Chemical Co., Calif.
INORGANIC POLYMERS PROGRAM, by E. G. Teach, G. A. Louis, and R. Brauer. Semi-annual technical rept. for 1 Jan-30 June 57 on Contract Nonr-2259 (00). July 57, 26p. 16 refs.
Order from LC mi$2.70, ph$4.80 PB 135 554

The preparation and study of diphosphines of alkyl hydrocarbons, fluorocarbons, and silanes has been studied. Ethylene chloride does not form a diphosphine when reacted with $NaPH_2$ and forms a polymer with NaPHEt. Trimethylene chloride gives an unstable diphosphine with $NaPH_2$ which changes to a polymer. Fluorocarbon iodides react with $NaPH_2$ to form the corresponding hydrofluorocarbon, sodium iodide, phosphine, and lower hydride of phosphorous. Dimethyl dichlorosilane reacts with $NaPH_2$ in an ether solvent to form the chlorophosphinosilane and other more complex materials still under study. Trimethyl chlorosilane reacts with $NaPH_2$ to give mostly tris(trimethylsilyl) phosphine and small amounts of the corresponding primary and secondary compounds. The alkyl phosphines react with diborane to give high melting polymers that are insoluble in common solvents and carbonize on heating in the air. Butylborondichloride and phosphine react in benzene in the presence of triethylamine to give an unknown solid whose analysis is not in agreement with earlier reported work.

Rochester U., N. Y.
THE PHOTOLYSIS OF AMMONIA IN THE PRESENCE OF NITRIC OXIDE, by A. Serewicz and W. Albert Noyes, Jr. Rept. on Contract AF 18(600)1528. 9 Feb 59, 12p. 6 refs. AFOSR TN-59-126; AD-210 430.
Order from LC mi$2.40, ph$3.30 PB 139 826

The products of the photolysis of ammonia in the presence of nitric oxide are N_2, N_2O, H_2O, and H_2. The last is a minor product unless the concentration of nitric oxide is very low.

Tufts U., Medford, Mass.
NON-SOLVATED ALUMINUM HYDRIDE, by John Rice, Jr. and George Chizinsky. Technical rept. on Contract Nonr-494(04). 1 Aug 56, 10p. 6 refs.
Order from LC mi$1.80, ph$1.80 PB 127 867

The preparation of non-solvated aluminum hydride is described. The properties of the compound are described and results of X-ray diffraction studies are given.

Organic Chemistry

Army Medical Research Lab., Fort Knox, Ky.
PREPARATION AND STUDY OF LEUCOCYANIDES OF TRIARYLMETHANE DYES, by Donald Tobin, Arthur Katzakian, and Morris Chisholm. Rept. on Field X-Ray Techniques. 5 Aug 57, 13p. 12 refs. Rept. no. 292.
Order from LC mi$2.40, ph$3.30 PB 136 421

An improved method for the preparation of leucocyanides of triarylmethane dyes is presented. A mechanism for both the photolysis of leucocyanides of triphenylmethane and triarylmethane dyes is discussed.

Columbia U., New York.
SOLVENT EFFECTS AND INITIATOR EFFICIENCY IN THE BENZOYL PEROXIDE-DIMETHYLANILINE SYSTEM, by Cheves Walling and Norman Indictor. Technical rept. no. 3 on Reactions of Organic Peroxides, Contract DA 30-069-ORD-1270. 18 Feb 58, 24p. 18 refs. CU-15-58-ORD-1270-Chem; AD-137 061.
Order from LC mi$2.70, ph$4.80 PB 135 697

The second order reaction between benzoyl peroxide (Bz_2O_2) and dimethylaniline (DMA) has been followed in two ways: directly by measuring undecomposed peroxide, and indirectly, by observing changing polymerization rates while the pair was being used as polymerization initiator. The latter method was checked by using initiators of known decomposition rate and afforded a rapid reasonably precise method of obtaining initiator efficiency. Efficiencies were measured for bulk and solution polymerization from 0° to 80°C. The reaction was strongly accelerated by pyridine; variation in rate with other solvents was also noted. The reaction of benzoyl peroxide with triethylamine yielded diethylvinylamine implying a new general path to eneamine preparation. It is concluded that the tertiary amine-benzoyl peroxide reaction involves the initial formation of an unstable intermediate which may decompose by competing radical and non-radical forming processes.

Goodrich, B. F., Co., Brecksville, Ohio.
BETA-PROPIOLACTONE AS A STERILANT, by W. L. Beears. Annual rept. 1953-54 on Contract DA 18-064-cml-2396. 31 Aug 54, declassified 30 Nov 56, 41p.
Order from LC mi$3.30, ph$7.80 PB 139 922

A liquid Freon system containing 20% β-propiolactone and a suitable co-solvent to effect solubility was developed for use as a space sterilant. This solution was capable of being vaporized in the atmosphere from a conventional aerosol container. The effects of this solution on a wide variety of materials of construction was studied.

Goodrich, B. F., Co., Brecksville, Ohio.
BETA-PROPIOLACTONE AS A STERILANT (II), by Warren L. Beears and Max Roha. Research rept. on Contract DA 18-064-cml-64. 31 Jan 56, declassified 30 Nov 56, 64p. 2 refs.
Order from LC mi$3.90, ph$10.80 PB 139 748

Aerosol formulations containing β-propiolactone have been developed as sterilants but their use is limited to comparatively small rooms. A stable lactone sterilant solution was needed for use in a Todd thermal generator to treat larger spaces and for washing walls and equipment. Quantitative studies show the 20% lactone in dioxane solution diluted 1:5 with water as it might be used to sterilize walls and equipment kills bacillus globigii spores in 15 minutes at 25° C. Twenty minutes exposure to 4% aqueous sterilant solution causes skin burns on humans. Conditions in an operating Todd are mild enough so that most inert solutions of β-propiolactone would be usable. Beta-propiolactone vapor was found to be its own safety indicator. The LD 50 exposure is about 0.5-0.6 mg/liter for two hours. Human beings find β-propiolactone vapor unbearable above 0.1 mg/liter.

Houston U., Tex.
THE NATURE AND SPECTRAL EFFECTS OF THE INTERACTION OF CERTAIN POLAR SOLVENTS WITH BENZOPHENONE, by Ralph S. Beck. Final rept. for 1 Mar 56-31 July 57 on Study of the Effect of Non-Hydrogen Bonding Solvents on n-π^* Electronic Transitions in Organic Molecules, Contract Nonr-1875(00). 15 Aug 57, 59p. 18 refs.
Order from LC mi$3.60, ph$9.30 PB 135 717

An investigation has been made to study the effect of certain solvent mixtures on the n-π^* electronic absorption band and the fundamental carbonyl group vibration of benzophenone. The solvents principally investigated were nitriles, alcohol and hydrocarbons. Propio-, butyro-, valero-and benzonitrile-hydrocarbon-benzophenone mixtures exhibit an isobestic point indicative of a simple two species equilibrium. Also, for these cases, the n-π^* band maximum changes by 500 cm^{-1} to the blue. A like acetonitrile system exhibits no isobestic point and a change in the n-π^* maximum of 725 cm^{-1} to the blue. Changes in the frequency of the fundamental carbonyl band show a similar relation of effectiveness among the nitriles. The data indicate electrostatic interaction between positive C atom of the nitrile group and a non-bonding pair of electrons on the carbonyl oxygen. The complex is suggested to be of a monomer nitrile-benzophenone type except in the case of the acetonitrile where a dimer nitrile-benzophenone complex also exists. The data on the effect of alcohol also suggests a predominance of monomer alcohol and dimer alcohol-benzophenone complexes. Chloroform causes a relatively large change of the n-π^* maximum (767 cm^{-1}) to the blue probably due to hydrogen bonding.

Naval Research Lab., Washington, D. C.
ADSORPTION OF SOLUBLE FLUOROCARBON DERIVATIVES AT THE ORGANIC-LIQUID/AIR INTERFACE, by A. H. Ellison and W. A. Zisman. Interim rept. 3 Feb 59, 14p. 19 refs. NRL rept. 5256.
Order from LC mi$2.40, ph$3.30 PB 136 844

Essential conditions are discussed for the adsorption of an amphipathic polar solute in an unassociated (or weakly associated) organic liquid, and exemplified by consideration of the possibility of high surface activity by fluorocarbon compounds dissolved in hydrocarbons or in chlorinated hydrocarbons. A number of amphipathic polar fluorocarbon derivatives, which were prepared for this investigation, have been studied with emphasis on the effects of varying the molecular weight and structure of the oleophobic and oleophilic portions of the molecule and of the ratio of the number of fluorine and hydrogen atoms per molecule. Data are presented on many compounds including those having mono-, di-, tri-, and tetra-functional groups in the oleophilic portion of the amphipathic molecule. Adsorption of several promising types of compounds at the free surface of the liquid was studied by measuring the surface tension lowering as a function of solute concentration for solutions in hexadecane, hexachlorobutadiene, and trichlorodiphenyl. Because some fluorinated solutes adsorb on smooth solids to increase considerably the contact angle of the solution, it was at times advisable to use methods of measuring the surface tension which were not dependent on the contact angle. This led to the use of the following methods: differential capillary rise, ring pull, maximum bubble pressure, and pendant drop. The merits and deficiencies of each method when used with such liquids and solutes are summarized. Because of the usual uncertainity about the thickness of the adsorbed surface phase, difficulties arose in computing from the Gibbs adsorption excess the extent of adsorption. Evidence is given for the formation in hexachlorobutadiene and trichlorodiphenyl of monolayer films of solute molecules. It is shown that the surface activity of a given solute increases exponentially with the difference between the surface tension of solvent and pure liquid solute. The problem of replacing all solvent molecules in the surface phase by solute molecules is discussed both in terms of the kinetics of competitive adsorption and the possibilities offered by appropriately synthesized materials. Because of solubility problems, it appears impossible to find a surface-active solute which will operate with high efficiency in a wide variety of organic liquids.

Plastics Lab., Princeton U., N. J.
CHAIN RUPTURE BY SHEAR IN MOLTEN POLYMER, by Herbert A. Pohl and J. Kenneth Lund. Rept. 12A on Contract DA 36-039-sc-70154. 26 Aug 58, 27p. 30 refs. Technical rept. no. 51A.
Order from LC mi$2.70, ph$4.80 PB 138 513

Polyisobutylene of a wide range of molecular weights was subjected to intense mechanical shear at varied temperatures. The force time curves in the capillary shear apparatus and the solution viscosities were determined.

Rochester U., N. Y.
PHOTOISOMERIZATION PROCESSES IN CYCLIC KETONES. II. CYCLOHEXANONE AND 2-METHYL CYCLOHEXANONE, by R. Srinivasan. Rept. on Contract AF 18(600)1528. 20 Dec 58, 14p. 16 refs. AFOSR TN-58-1128; AD-207 973.
Order from LC mi$2.40, ph$3.30 PB 139 862

5-hexenal has been identified as one of the products of the vapor phase photolysis of cyclohexanone at 3130 A. Quantum Yields for the formation of 5-hexenal have been obtained as a function of temperature and pressure, and in the presence of oxygen or carbon dioxide. The photoisomerisation also occurs in the pure liquid phase and in methyl pentane solution. The photolysis of 2-methyl cyclohexanone as a pure liquid, apparently gives rise to only one isomeric product, which is most probably trans-5-heptenal. The photoisomerisation of these two ketones closely resembles the corresponding process in cyclopentanone and probably proceeds by the same mechanism.

Rochester U., N. Y.
THE PHOTOLYSIS OF dl-CAMPHOR IN SOLUTION, by R. Srinivasan. Rept. on Contract AF 18(600)1528. 20 Jan 59, 8p. 8 refs. AFOSR TN-58-375; AD-154 282.
Order from LC mi$1.80, ph$1.80 PB 139 863

The present work was undertaken to study the photolysis of dl-camphor in air-free non-aqueous solvents, identify the products and determine the efficiency of these processes.

Rochester U., N. Y.
THE PHOTO-OXIDATION OF ISOPROPYL IODIDE, by G. R. McMillan. Rept. on Contract AF 18(600)1528. 14 Jan 59, 9p. 9 refs. AFOSR TN-59-32; AD-209 204.
Order from LC mi$1.80, ph$1.80 PB 139 825

Recent work has given some information about the mechanism of the photochemical decomposition of isopropyl iodide vapor. The present study represents an extension of this work to gain information about the reactions of the isopropyl radical with oxygen. The photo-oxidation of isopropyl iodide has been investigated by Emschwiller, who reported acetone among the products of the vapor and liquid phase reaction. Other products detected in the liquid system were carbon dioxide propylene, possibly carbon monoxide and a viscous oil.

Rochester U., N. Y.
REACTIONS OF METHYL RADICALS WITH WATER ON QUARTZ AND PYREX SURFACES, by P. Ausloos and J. Paulson. Rept. on Contract AF 18(600)1528. 20 Nov 57, 5p. 3 refs. AFOSR TN-57-740; AD-136 725.
Order from LC mi$1.80, ph$1.80 PB 135 691

Acetone-d_6 was subject to photolysis and radiolysis in the presence of H_2O in cylindrical quartz and pyrex cells. The photolysis was carried out with a Hanovia (16A-13) SH type medium-pressure lamp. For the radiolysis, Co^{60} of about 485 c was used. The cells were filled with the vapor of 95.5% deuterated acetone and water vapor condensed into the cells at -195°C after which the cells were sealed off. Substantial amounts of CD_3H were formed even at a H_2O concentration of less than 0.1 mol-%. The CD_3H/CD_4 is independent of the H_2O concentration but falls drastically in radiolysis at temperatures above 110°C. $CD_3H/C_2D_6^{1/2}$ is independent of acetone and H_2O but increases with temperature. Flaming out of the cells decreases the CD_3H/CD_4. CD_3H is formed by the abstraction of H by CD_3 from H_2O adsorbed on the wall. The independence of $CD_3H/C_2H_6^{1/2}$ from acetone concentration indicates that all CD_3 radicals reach the wall and that abstraction and recombination are two competing reactions.

Utah U., Salt Lake City.
THE EFFECT OF PRESSURE ON THE RACEMIZATION OF NITRO DIPHENIC ACID, by C. C. McCune, F. Wm. Cagle, Jr., and S. S. Kistler. Technical Rept. 2 on Contract Nonr-1288(02). Nov 57, 20p. 34 refs.
Order from OTS $0.75 PB 151 323

A review is given of various studies, with references, on the effect of pressure on polymerization. Both theory and actual compounds are covered. Second half of report is devoted to the present research. The pressure effect on the rate of racemization of an optically active biphenyl should provide a particularly simple case, and the data obtained should be open to a straightforward interpretation. Since such data have not been made available, a study of the racemization of an aqueous solution of the sodium salt of 1-6-nitro-2,2'-carboxydiphenyl at pressures from atmospheric to 12,000 atmospheres was made.

Washington U., Seattle.
TECHNICAL REPORTS 17, 18, 19. Rept. on Contract Nonr-477(16). [1958] 37p. 16 refs.
Order from LC mi$3.00, ph$6.30 PB 139 895

16. Reactions of trifuloromethyl hypofluorite with organic compounds, by John A. C. Allison and George H. Cady
17. Thermal decomposition of fluorine nitrate, by William Eugene Skiens and George H. Cady
18. Arsenyl fluoride, by Grihapti Mitra

Physical Chemistry

ARDE Associates, Newark, N. J.
SURVEY OF THE ROLE OF CHEMISTRY IN PREMIXED COMBUSTION PHENOMENA, by E. Mayer and R. R. John. Final rept. on Contract AF 18(600)1560. Oct 57, 144p. 257 refs. Technical

rept. 4555-2; AFOSR TR-57-79; AD-136 647.
Order from OTS $2.75 PB 151 238

The role of chemistry in premixed gaseous combustion phenomena is discussed on the basis of a critical survey of the literature. The phenomena considered include laminar flame propagation, space-homogeneous combustion, ignition, quenching and stability limits. The current literature dealing with these phenomena is critically reviewed. Problem areas of interest are described. An annotated selective bibliography dealing primarily with current topics concludes the discussion of each phenomenon considered.

[Army] Chemical [Warfare] Labs., Army Chemical Center, Md.
SOLUBILITY OF CHROMIC ANHYDRIDE IN CHLORIDE, by Lionel J. Bailin and Bernard M. Zeffert. Special rept. 22 Oct 54, 8p. 3 refs. CRLR-409.
Order from LC mi$1.80, ph$1.80 PB 137 466

The object of this report was to determine the solubility curve for the system chromic anhydride (CrO_3)-chromyl chloride (CrO_2Cl_2) over an extended temperature range.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
PROPELLANT SURFACE AREA CALCULATIONS FOR INTERIOR BALLISTIC SYSTEMS, by Jerome M. Frankle and James R. Hudson. Jan 59, 27p. 5 refs. Memo. rept. no. 1187.
Order from LC mi$2.70, ph$4.80 PB 140 023

A method is presented for calculating propellant surface areas during burning. This scheme, which includes the slivering region, is particularly suited to the solution of interior ballistic equations by high-speed digital computer. An approximate method, even more economical of computer memory space and time, is also derived and compared to the more rigorous scheme. Curves comparing the results of the two types of calculation for examples of propellant grains with one and seven perforations are included.

California U., Berkeley.
ON THE DEVELOPMENT OF GASEOUS DETONATION. III. IONIZATION WORLD LINES, by G. J. Hecht, A. J. Laderman and others. Technical note DR 3 on Contract AF 49(638)166. Jan 59, 60p. 32 refs. AFOSR TN-58-1133; AD-208 082.
Order from LC mi$3.60, ph$9.30 PB 139 920

The design and construction of an ionization detection circuit to measure ionization world lines during the development of detonation is described. The ionization processes occurring in flames, shocks, and detonations are reviewed. A critical survey of existing ionization gages is made. The evaluation of performance criteria for the present purpose is described and the design of the gage and electronic apparatus reported. The operation of the instrument is demonstrated by means of experiments performed with stoichiometric hydrogen-oxygen mixtures. It appears that the apparatus is a reliable and sufficiently accurate instrument for the measurement of ionization world lines during the development of detonation and that it can be adjusted so that within most of the operating range it registers the world lines of the flame front.

Callery Chemical Co., Pa.
REACTIONS OF SODIUM BOROHYDRIDE WITH AMINE SALTS, by H. W. McDanel and L. S. Stone. 20 Nov 56, 17p. 20 refs. Rept. no. CCC-1024-TR-209.
Order from LC mi$2.40, ph$3.30 PB 129 502

Reactions of sodium borohydride with various amine hydrochlorides were investigated to prepare volatile boron-nitrogen hydrides. Compounds obtained include N, N', N"-trimethylborazine (from methylammonium chloride), ethylenediammonium diborohydride, ethylenediamine-bis-borane, trimethylamine-borane, pyridine-borane, dimethylaminodiborane (from dimethylammonium hydrogen sulfate), and diborane diammoniate (from ammonia-boron trifluoride). The desired products were not obtained from anilinium chloride, ammonium hydrogen sulfate, or several alkyl amine compounds with boron trifluoride.

Chicago Development Corp., Riverdale, Md.
ELECTRODE POTENTIAL MEASUREMENTS ON INTERSTITIAL OXYGEN SOLUTIONS IN TITANIUM AT LOW OXYGEN CONCENTRATIONS: APPLICATION TO QUALITY CONTROL IN HIGH PURITY TITANIUM, by R. S. Dean and I. Hornstein. Rept. on Contract AF 18(600)1458. Apr 57, 23p. 13 refs. AFOSR-TN-57-179.
Order from LC mi$2.70, ph$4.80 PB 129 901

Connecticut U., Storrs.
DETERMINATION OF THE APPLICABILITY OF CERTAIN PHOTOCHEMICAL REACTIONS TO PHOTOGRAPHY, by Roland Ward. Final rept. for 1 Oct 50-15 Sep 56 on Photochemical Studies, Contract DA 36-039-sc-211. 1956, 94p. 129 refs.
Order from OTS $2.25 PB 151 178

This final report is devoted principally to a summary of the research on photosensitive coordination complexes. References are given to the quarterly reports for the details of the other topics which were investigated more briefly.

Connecticut U., Storrs.
THERMODYNAMIC FUNCTIONS OF TIN TETRAMETHYL AND GERMANIUM TETRAMETHYL, by E. R. Lippincott and M. C. Tobin. Technical rept. no. 2 on Contract N8onr-727(00). 1951, 30p. 16 refs. ATI-125 623.
Order from LC mi$2.70, ph$4.80 PB 139 184

Electrical Engineering Research Lab., U. of Illinois, Urbana.
ELECTRON-ION RECOMBINATION IN IONIZED NITROGEN GAS STUDIED BY MICROWAVE TECHNIQUES, by Edward P. Bialecke and A. A. Dougal. Scientific rept. no. 4 on Contract AF 19(604)2152.

15 May 58, 76p. 17 refs. AFCRC TN-58-159; AD-152 393.
Order from LC mi$4.50, ph$12.30 PB 135 398

This work reports an experimental study of electron-ion recombination in ionized nitrogen gas performed by microwave techniques and in which the electron-ion recombination coefficient was studied as a function of pressure and temperature. Nitrogen gas was ionized to form a plasma in which, when it was allowed to disintegrate, recombination of the electrons and ions present in the plasma occurred. Using microwave techniques, the concentration of electrons was found at any particular time in the disintegration of the plasma. The recombination coefficient was found in this research to increase with increasing pressure and decrease with increasing temperature. The results of this research are compared to the results of others who also have measured the electron-ion recombination coefficient in ionized nitrogen gas, but in different ranges of pressure. Although attempts to measure the collision frequency and the momentum and energy transfer parameters were thwarted in this study, the difficulties encountered are enumerated and identified.

Experiment, Inc., Richmond, Va.
COMBUSTION OF BORON, by Lloyd E. Line, Jr. Status rept. on Contract NOas-53-073-c. Apr 55, 30p. 10 refs. Technical pub. no. 97; EXP-120.
Order from LC mi$2.70, ph$4.80 PB 128 504

The dust apparatus previously described has been modified and further developed. A light-absorption apparatus (densitometer) for measuring the concentration of dust in the moving dust column and a means for igniting the dust have been incorporated in the apparatus. A dense (200 milligrams per liter or greater) wall-free column of high-purity boron dust has been found difficult to ignite with an electric spark (energies up to about 6 joules and in a few cases over 100 joules) in any mixture of oxygen and nitrogen. Magnesium was found to ignite more easily than did boron but with more difficulty than would be expected from results reported in the literature. The discrepancy may be associated with the effects of the apparatus, such as absence of wall confinement, diameter of the dust column, and turbulence.

Franklin Inst. Labs. for Research and Development, Philadelphia, Pa.
DIFFUSION OF COBALT AND CHROMIUM IN CHROMITE SPINEL, by Raydong Sun. Final rept. on Contract Nonr-1861(00). Sep 57, 17p. 6 refs. Rept. no. F-A1897.
Order from LC mi$2.40, ph$3.30 PB 135 716

The diffusion of cobalt and chromium in sintered samples of $CoCr_2O_4$ in the temperature region 1400° C - 1600° C can be represented as

$$D_{Co} = (10^{-3}) \exp(-51000/RT)$$

$$D_{Cr} = (2) \exp(-70,000/RT)$$

Frick Chemical Lab., Princeton U., N. J.
A SPECTROSCOPIC INVESTIGATION OF THE NITRIC OXIDE-OZONE REACTION, by J. C. Greaves and D. Garvin. Technical note no. 3 on Contract AF 18(600)134. 17 July 58, 25p. 15 refs. AFOSR TN-58-744; AD-201 510.
Order from LC mi$2.70, ph$4.80 PB 137 688

The spectrum of the emission accompanying the reaction of nitric oxide with ozonized oxygen containing 4% ozone has been recorded photographically between 5900 and 10850 Å, but has not yet been successfully analysed. A complex system of unresolved bands is observed overlying an apparent continuum. The emitter responsible for the bands is believed to be an excited nitrogen dioxide molecule formed in the reaction: $NO + O_3 \longrightarrow NO_2 + O_2$. From the position of the short wavelength limit of the spectrum, it is apparent that some of the nitrogen dioxide molecules which are formed carry away nearly 100% of the energy of reaction. There is thus a large non-equilibrium distribution of energy in the reaction zone.

Illinois U., Urbana.
IONIC CONDUCTIVITY AND DIFFUSION IN CESIUM BROMIDE AND CESIUM IODIDE, by David W. Lynch. Technical rept. no. 1 on Physics of the Solid State, Contract Nonr-1834(19). June 58, 75p. 31 refs.
Order from LC mi$4.50, ph$12.30 PB 139 962

Ionic transport properties of CsBr and CsI were investigated by means of electrical conductivity measurements and tracer diffusion coefficient measurements on single crystals. It is concluded that ionic transport is responsible for nearly all of the observed conductivity of both CsBr and CsI. Unlike the alkali halides of the NaCl structure, the predominant mobile defects in CsBr and CsI are the anionic defects.

Institute for Cooperative Research, Johns Hopkins U., Baltimore, Md.
CHARACTERISTICS OF D-C ARCS WITH TITANIUM ANODES AND TUNGSTEN CATHODES IN INERT GAS SYSTEMS, by T. Benjamin Jones and E. Howard Young. Technical rept. no. 1 on Fundamental Characteristics of Titanium Arcs in the Inert Gases, Contract DAI 36-034-505-ORD(P)-1. Mar 56, 66p. 4 refs. WAL no. 401/267.
Order from LC mi$3.90, ph$10.80 PB 128 187

This report describes the results an experimental study of direct current arcs employing titanium electrodes in atmospheres of argon, helium and argon-helium mixtures. Arcs over the current range of 2-200 amperes were studied under carefully controlled laboratory conditions using a vacuum tight cell in which the gases could be maintained in an uncontaminated state at atmospheric pressure.

Instituto Nacional de Tecnica Aeronautica (Spain).
CALCULATION OF THE PROPAGATION VELOCITY OF A PLANE LAMINAR FLAME, by J. M. de Sendagorta. Rept. on Contract AF 61(514)997. 8 June 57, 18p. AFOSR TN-57-668; AD-136 657.
Order from LC mi$2.40, ph$3.30 PB 135 587

A method of calculation is proposed which is applicable to flames with chemical reactions whose advancement is determined by the products concentration and whose molecularity is of first or second order, and where the Lewis-Semenov number may differ from unity.

Mallinckrodt Chemical Lab., Harvard U., Cambridge, Mass.
AN IMPROVED NUCLEAR MAGNETIC RESONANCE APPARATUS AND STUDY OF SANDWICH COMPOUNDS, Etc., by L. N. Mulay. Technical rept. on Contract Nonr-1866(13). May 57, 64p. 20 refs.
Order from LC mi$3.90, ph$10.80 PB 136 419

Massachusetts Inst. of Tech., Cambridge.
THE FLUORINATION OF CARBIDES, by James R. Aronson and Walter C. Schumb. Final rept. on Contract Nonr-1841(07). 15 Oct 57, 26p. 9 refs.
Order from LC mi$2.70, ph$4.80 PB 137 766

A group of seven carbides (silicon carbide, boron carbide, chromium carbide, iron carbide, titanium carbide, aluminum carbide, and calcium carbide) representative of the various structural types, has been fluorinated using elementary fluorine gas. All reactions yielded similar mixtures of low molecular weight fully saturated fluorocarbons, and there appears to be no observable correlation between the composition of the fluorocarbon mixture and the structure of the carbides. Techniques employed in this program include infrared spectroscopy and vapor phase chromatography. Further work is in progress, in which fluorinating agents other than the elementary gas will be employed.

Minnesota U., Minneapolis.
Be-C EQUILIBRIA, by Gust Bitsianes, William S. Brown and others. Final progress rept. on Nepa Proj. SC-2017. Nov 50, declassified 16 Oct 57, 22p. NEPA 1632; AD-143 438.
Order from LC mi$2.70, ph$4.80 PB 135 676

The initial work on this project was directed primarily to the determination of the phase diagram of the beryllium-carbon system. During the course of the investigation, nitrogen contamination was avoided with such difficulty and had such a marked effect on this system that the program was broadened to include work on the beryllium-nitrogen and the beryllium-carbon-nitrogen systems. One important result of the nitrogen work was the discovery of a hitherto unreported nitride, the x-nitride.

Naval Research Lab., Washington, D. C.
THE MEASUREMENT OF THE PHYSICAL AND CHEMICAL PROPERTIES OF THE SODIUM POTASSIUM ALLOY, by C. T. Ewing and R. R. Miller. Quarterly progress rept. no. 1. 30 Sep 46, 74p. Rept. P-3010.
Order from LC mi$4.50, ph$12.50 PB 129 268

The alloys of potassium-sodium are under a study as a heat transfer medium. Physical and chemical properties, along with measurements of heat transfer coefficients on an engineering scale, are being studied. This report is concerned more with the description of apparatus and methods than with measured results; however, preliminary measurements on density and viscosity are included.

Naval Research Lab., Washington, D. C.
THERMODYNAMIC PROPERTIES OF FACE-CENTERED CUBIC LATTICES. PART I. A NAREC CALCULATION OF THE VIBRATION SPECTRA AND DISPERSION RELATIONS, by W. C. Overton, Jr. and E. Dent. Final rept. 9 Mar 59, 89p. 15 refs. NRL rept. 5252.
Order from LC mi$4.80, ph$13.80 PB 136 511

The vibration spectra of face-centered cubic lattices have been calculated with the aid of the Naval Research Laboratory's electronic digital computer (Narec). The lattices are represented by the two-force-constant central-force model, and for this model all calculations can be carried out in terms of a single parameter γ/α, where α is the nearest neighbor force constant and γ that for next-nearest neighbors. Three contributions to each spectrum (the frequency distribution functions corresponding to the longitudinal, high transverse, and low transverse branch solutions of the equation for the frequencies of vibration) were calculated for 11 values of γ/α: -0.25, -0.20, -0.15, -0.10, -0.05, 0.0, 0.05, 0.10, 0.15, 0.20, 0.25. This range of γ/α corresponds to the lattice elastic properties ranging from complete elastic anisotropy to complete elastic isotropy. The spectra are given in tabular form and can be readily adapted to the calculation of the thermodynamic properties (such as the lattice specific heat) of the 11 lattices. Then by interpolation, the thermodynamic properties of all 21 of the natural elements which crystallize into the face-centered cubic lattice can be obtained. In addition to the table of spectra, extensive tables of dispersion relations (frequency of vibration as a function of wave number) are included. With the aid of these dispersion relations detailed properties of the spectra such as the behavior around critical points can be deduced.

New York State Coll. of Ceramics, Alfred U.
THE CHEMICAL PHYSICS OF FERRITES, by T. J. Gray. Rept. on Contract Nonr-1503(01). Dec 56, 153p. 176 refs.
Order from LC mi$7.50, ph$24.30 PB 130 342

The field of ferrites is of particular importance for a very wide variety of electronic applications. Although considerable research effort has been expended in this field, the fundamental chemical and physical considerations are as yet imperfectly understood. Certain general principles have been proposed covering many separate aspects and it is the intention of this review to group existing information together in such a manner that a comprehensive, although necessarily qualitative, understanding may be achieved. A very considerable, but by no means exhaustive, bibliography has been included to relieve those newly entering this important field of some of the tedium of a detailed literature survey.

Pennsylvania State [U.] Mineral Industries Experiment Station [University Park].
CRYSTAL CHEMISTRY STUDIES, by Rustum Roy, M. W. Shafer, and others. Quarterly progress rept. no. 2, 1 Oct-31 Dec 54, on Contract DA-36-039-sc-63099. 10 Jan 55, 69p. 38 refs.
Order from LC mi$3.90, ph$10.80 PB 136 593

Work on the quartz structure of gallium compounds, and the Na_2O - Nb_2O_5 system. (See also PB 136 592)

Pennsylvania State [U.] Mineral Industries Experiment Station [University Park].
CRYSTAL CHEMISTRY STUDIES, by Rustum Roy, M. W. Shafer and others. Quarterly progress rept. no. 1, 1 July-30 Sep 54, on Contract DA 36-039-sc-63099. 10 Oct 54, 17p. 8 refs.
Order from LC mi$2.40, ph$3.30 PB 136 592

Several new compounds having silica structures have been prepared and studied. One of these, $GaPO_4$, was chosen for intensive study. Work has been initiated in the study of phase equilibrium of sodium niobate system.

Pennsylvania State [U.] Mineral Industries Experiment Station [University Park].
CRYSTAL CHEMISTRY STUDIES, by Rustum Roy, M. W. Shafer and others. Quarterly progress rept. no. 3, 1 Jan-31 Mar 55, on Contract DA 36-039-sc-63099. 10 Apr 16p. 6 refs.
Order from LC mi$2.40, ph$3.30 PB 136 594

Studies in the field of the crystal chemistry of the quartz structure continue with the exploration for and determination of the properties of all likely $A^{3+}B^{5+}O_4$ compounds. Quantitative work on the effect of three type-additives on the quartz structure (when in solid solution) has been started. The study of the system Na_2O - Nb_2O_5 is nearing completion, and with a determination of the influence of composition on the inversions of the $NaNbO_3$ phase using new apparatus should soon be finished. Equipment for runs in the region 0-800°C and 0-25,000 atmospheres has been modified and developed continually and a reasonably workable assemblage is available. This has been successfully calibrated for pressure up to 20,000 atmospheres using known pressure inversions at room temperature. Almost all the data obtained with this equipment have so far proved to be negative. (See also PB 136 593)

Pennsylvania State U. Mineral Industries Experiment Station, University Park.
CRYSTAL CHEMISTRY STUDIES, by Rustum Roy, E. C. Shafer and others. Quarterly progress rept. no. 5, 1 July-30 Sep 55, on Contract DA 36-039-sc-63099. 5 Oct 55, 14p. 3 refs.
Order from LC mi$2.40, ph$3.30 PB 136 595

Work continues or has been started in the following fields: the crystal chemistry of quartz, especially to determine the solid solubility relations between well-known substances each having the quartz structure; relative stability of phases in the system Mn-O-OH; refractory oxide combinations of the pyrochlore structure group. (See also PB 136 594)

Pennsylvania State U. Mineral Industries Experiment Station, University Park.
CRYSTAL CHEMISTRY STUDIES, by Rustum Roy, E. C. Shafer and others. Quarterly progress rept. no. 6, 1 Oct-31 Dec 55, on Contract DA 36-039-sc-63099. 10 Jan 56, 23p. 4 refs.
Order from LC mi$2.70, ph$4.80 PB 136 596

In the system Mn-O-OH a successful system has been devised for making easily and quickly runs in a high oxygen pressure atmosphere, and in mixed O_2-H_2O pressures at temperatures up to 800°C. Using this, equilibrium data have been obtained for the MnO_2-MnO_2-Mn_2O_3 and MnO·OH-Mn_2O_3 reaction. Further data on the quartz-tridymite inversion in $AlPO_4$ have been obtained. New compounds with the pyrochlore structure have been found in the many compositions which have been prepared and the limits of the formation of this structure as compared to other $A_2B_2X_7$ structures are being determined. (See also PB 136 595)

Pennsylvania State U. Mineral Industries Experiment Station, University Park.
CRYSTAL CHEMISTRY STUDIES. Quarterly progress rept. no. 7, 1 Jan-31 Mar 56, on Contract DA 36-039-sc-63099. 10 Apr 56, 49p. 3 refs.
Order from LC mi$3.30, ph$7.80 PB 136 597

Contents:
Experimental data
The system Mn-O-OH
Crystal chemistry of quartz
The pyrochlore group
Miscellaneous
Appendices:
Technical report no. 8: "New data on the system $AlPO_4$"
Technical report no. 9: "OH - F exchange in fluorine phlogopite"
(See also PB 136 596)

Pennsylvania State U. Mineral Industries Experiment Station, University Park.
CRYSTAL CHEMISTRY STUDIES, Quarterly progress rept. no. 8, 1 Apr-1 July 56, on Contract DA 36-039-sc-63099. 20 July 56, 12p.
Order from LC mi$2.40, ph$3.30 PB 136 598

The manganese work has been involved in a period of rather detailed and exhaustive checking of experimental results in view of the discrepancy with the literature values. So far the general outline of the experimental results presented in the last report appears to be confirmed at the oxygen-rich end. The quartz work has led to an essentially complete picture of the SiO_2-GeO_2 system. Work in the system SiO_2 itself has proved to be of considerable interest due to the importance of SiO_2. $LiAlSiO_4$-SiO_2 work has been temporarily suspended. Further work with the pyrochlore structure phases has shown new possibilities for anion and cation replacement. (See also PB 136 597)

Pennsylvania State U. Mineral Industries Experiment Station, University Park.
CRYSTAL CHEMISTRY STUDIES, by Rustum Roy,

V. G. Hill and others. Final rept. on Contract DA 36-039-sc-63099. 20 Oct 56, 97p. 40 refs.
Order from LC mi$5.40, ph$15.30 PB 136 599

Contents:
Experimental data
Quartz
Mn-O-OH work
Pyrochlore
Spinel - Ferrites
Miscellaneous
Appendices:
Interim report: "Contribution to the crystal chemistry of the pyrochlore structure"
Technical report no. 10: "The system GeO_2-SiO_2"
Technical report no. 11: "The influence of ionic substitution on the stability of micas and chlorites"
Technical report no. 12: "Phase relations in the system $BaCl_2$-$BaTiO_3$" (See also PB 136 598)

Pennsylvania State U. Mineral Industries Experiment Station, University Park.
CRYSTAL CHEMISTRY STUDIES, by E. Aleshin, V. G. Hill and others. Quarterly progress rept. no. 1, 1 Oct - 31 Dec 56, on Contract DA 36-039-sc-71214; Continuation of Contract DA 36-039-sc-63099. 10 Jan 57, 34p. 4 refs.
Order from LC mi$3.00, ph$6.30 PB 136 611

Continuum of work on (1) a new locality for ramsdellite, (2) preparation of Mn-O-OH phases, (3) the quartz-tridymite inversion and (4) the high pressure region of the isomorphs of SiO_2. (See also PB 136 599)

Pennsylvania State U. Mineral Industries Experiment Station, University Park.
CRYSTAL CHEMISTRY STUDIES, by E. Aleshin, V. G. Hill and others. Quarterly progress rept. no. 2, 1 Jan-31 Mar 57, on Contract DA 36-039-sc-71214. 24 Apr 57, 26p. AD-132 869.
Order from LC mi$2.70, ph$4.80 PB 136 612

Nearly complete data were obtained for the systems $MgFe_2O_4$-Fe_2O_3, $ZnFe_2O_4$, and $NiFe_2O_4$-Fe_2O_3 from 1000° to 1450°C each at two O pressures (1 and 0.21 atm). Further studies were made of low-temperature oxidation-reduction reactions of the manganese oxides and oxyhydroxides; the entire equilibrium work in the dry Mn-O system was repeated with a different type of silica glass tubing. In the SiO_2 work, the polymorphism and disorder in cristobalite were considered. In very high purity cristobalite, the extent of disordering controls the α-β inversion temperature; a correlation between X-ray and thermal observations was obtained. A quantitative study of phase relations showed no measurable solid solution between $Cd_2Nb_2O_7$ and $NaNbO_3$ from 800° to 1100°C. The problem of pyrochlores as ordered fluorites was studied in the case of $La_2Zr_2O_7$ and others. IR absorption spectra supported the contention that coesite does not contain 6-coordinated silica; high pressure polymorphs of the half-breed derivatives of the silica structures were absent. (See also PB 136 611)

Pennsylvania State U. [Mineral Industries Experiment Station] University Park.
CRYSTAL CHEMISTRY STUDIES, by E. Aleshin, V. G. Hill and others. Quarterly Progress rept. no. 3, 1 Apr-30 June 57, on Contract DA 36-039-sc-71214. 20 July 57, 9p.
Order from LC mi$1.80, ph$1.80 PB 136 613

Experimental work on phase equilibria in the ferrite systems Zn Fe_2O_4-Fe_2O_3 $NiFe_2O_4$-Fe_2O_3 and $MgFe_2O_4$-Fe_2O_3 has been completed, with analyses for Fe^{2+} in the spinel phases formed at various temperatures and oxygen pressures. The Mn-O-OH work is reaching its final stages. Interconversions of the various oxides and oxyhydroxide phases have been studied with good results except in the case of the poorly crystallized oxides. The new phase has been more fully characterized. The pyrochlore work has involved the investigation of equilibria in the systems $CdNb_2O_6$-$NaNO_3$, $Cd_2Nb_2O_7$-$CdNb_2O_5F_2$, $Cd_2Nb_2O_7$-$NaNbO_3$. (See also PB 136 612)

Pennsylvania State U., Coll. of Mineral Industries, University Park.
GLASS FORMATION IN THE SYSTEM KNO_3-$Ca(NO_3)_2$, by Sigmund Urnes. Technical rept. no. 73 on Contract N6onr-269(08). Aug 57, 19p. 14 refs.
Order from LC mi$2.40, ph$3.30 PB 135 730

Contents:
The state of the nitrate ion in nitrate glasses
Structural interpretation of freezing
Point data for the system KNO_3-$Ca(NO_3)_2$

Rensselaer Polytechnic Inst., Troy, N. Y.
HEAT OF FUSION, ENTROPY OF FUSION AND CRYOSCOPIC CONSTANT OF THE LiCl-KCl EUTECTIC MIXTURE, by C. Solomons, J. Goodkin and others. Technical rept. no. 3 on Electrochemistry of Molten Alkali and Alkaline Earth halides containing halides of Titanium, Contract Nonr-591(06). Aug 57, 16p. 13 refs.
Order from LC mi$2.40, ph$3.30 PB 135 723

Measurements of the heat of fusion of LiCl-KCl eutectic mixture have been made. The results are compared with the results of a previous measurement by other workers and with a value computed by the aid of the Kirchhoff Equation from thermal data for the pure constitutent salts. Calculations have also been made of the entropy of fusion and cryoscopic constant of the eutectic. It is recommended that the values obtained in the present work (heat of fusion = 3.2 ± 0.006 kcal. $mole^{-1}$, entropy of fusion = 5.1 ± 0.1 kcal. $mole^{-1}deg^{-1}$, cryoscopic constant = 13.7 ± 0.3 def. $mole^{-1}kg.$) be adopted for use in quantitative calculations of thermodynamic properties in this melt as solvent.

Rocketdyne, Canoga Park, Calif.
RESEARCH ON NITRIC ACID-SUPPORTED COMBUSTION, by George J. Casaletto. Quarterly progress rept. no. 4 [15 Jan]-15 Apr 58, on Contract

AF 49(638)163. May 58, 21p. 4 refs. R-665-4.
Order from LC mi$2.70, ph$4.80 PB 135 609

Experimental results are presented detailing appearance, flame speeds, and product analyses of flames of nitric acid with propane, methane, hydrogen and acetylene.

Tufts [U.] Medford, Mass.
INFRARED SPECTRA OF ABSORBED MOLECULES, by Victor A. Crawford. Scientific rept. no. 1 on Contract AF 19(604)4063. 7 Jan 59, 30p. 43 refs. AFCRC-TN-59-141; AD-211 605.
Order from LC mi$2.70, ph$4.80 PB 139 899

The intention was to write a continuous story, the object of which is to use the various solid-gas systems that have been studied to illustrate how spectroscopic methods may be used to throw light on certain general problems of adsorption. The traditional distinction between physical and chemisorption is observed.

Wayne State U., Detroit, Mich.
DITYNDALLISM, CONSERVATIVE DICHROISM AND BIDISSYMETRY, PROMISING EFFECTS FOR THE DETERMINATION OF THE SHAPE OF COLLOIDAL PARTICLES AND MOLECULES, by Wilfried Heller. Technical rept. no. 23 on Contract Nonr-736(00); Technical rept. no. 2 on Contract [DA 20-18-ORD-13388]. 12 June 57, 31p. 26 refs. AD-134 157.
Order from LC mi$3.00, ph$6.30 PB 135 274

The phenomena of anisotropic light scattering expected upon orientation of non-spherical macromolecules and particles are described, possible methods for their investigation are indicated and the present status of their theoretical treatment is outlined. The "dityndallism" observed laterally for incident linearly polarized light, the "conservative dichroism," its complement in the transmitted light, and the dityndallism for incident upolarized light and also associated phenomenon of "bidissymetry" are recognized as very promising effects for determining quantitatively the dimensions of rigid non-spherical macromolecules and colloidal crystals and the hydrodynamic deformability of non-rigid bodies such as random coils subjected to hydrodynamic shear. Other applications of the phenomena, with which four types of birefrigence may be associated, are also enumerated.

EARTH SCIENCES

Coastal Studies Inst., Louisiana State U., Bator Rouge.
MORPHOLOGICAL EFFECTS OF HURRICANE AUDREY ON THE LOUISIANA COAST, by James P. Morgan, Lewis G. Nichols, and Martin Wright. Technical rept. no. 10 on Contract N7onr-356(08). 1 June 58, 58p. 24 refs. Contribution no. 58-3.
Order from LC mi$3.60, ph$9.30 PB 139 869

An evaluation was made possible by two factors: previous surveys of detailed beach profiles made at stations which could be reoccupied after the storm and the ability to compare before-and-after aerial photographs of the storm-affected areas. This report is based on three types of evidence: (1) Detailed familiarity with the hurricane-affected region by trained personnel. (2) Resurvey of 13 beach profiles at stations established before the hurricane. (3) Specific comparison of July 15, 1957 aerial photographs with photos flown in November, 1955 and January, 1956 and several earlier sets of photographs.

Quartermaster Research and Engineering Center, Natick, Mass.
SIGNIFICANT ENVIRONMENTAL CONTRASTS OF THE THULE AND NARSARSSUAK, GREENLAND AREAS (INCLUDING THE ADJACENT ICECAP AREAS), by Donald W. Hogue. Nov 58, 25p. 15 refs. Research Study rept. RER-23.
Order from LC mi$2.70, ph$4.80 PB 139 893

This study is intended to furnish pertinent information on the relative merits of the two sites Thule and Narsarssuak and their adjacent icecap areas for testing equipment and research purposes.

Climatology and Meteorology

Air Force Cambridge Research Center, Bedford, Mass.
EQUIPMENT AND TECHNIQUES FOR IN-FLIGHT DEPLOYMENT OF LONG TRAIN INSTRUMENTATION PACKAGES FROM HIGH-ALTITUDE BALLOONS, by Arlo E. Gilpatrick and Romain C. Fruge, Jr. Sep 58, 26p. 2 refs. Instrumentation for Geophysics and Astrophysics no. 9; AFCRC TR-58-258; AD-160 750.
Order from LC mi$2.70, ph$4.80 PB 137 894

This report discusses and describes a technique and the equipment necessary to deploy and accurately position (relative) several instrumented canisters weighing a total of 300 pounds along a 3000-foot line during ascent of a high-altitude balloon. The system is compact at time of launch. Its configuration and equipment should satisfy a number of anticipated requirements; and, if major changes are required in the system's capacity, they can be made by simple design modifications. This technique is concluded to be ideally suited for positioning long trains of delicate instruments from ascending high-altitude balloons for such purposes as the simultaneous measurement and telemetering of ambient pressures and temperatures, measurements sufficient for gradient determinations in the earth's atmosphere.

Air Weather Service, Scott AFB, Ill.
ESTIMATING THE PROBABILITY OF HURRICANE-FORCE WINDS AFFECTING AN AIR BASE, by S. J. Kimball. June 58, 17p. AWS Technical rept. no. 105-146.
Order from LC mi$2.40, ph $3.30 PB 135 393

This study provides an objective means of estimating the chances of a base being affected by hurricane winds of a storm whose forecast track indicates a possibility of the base being struck. It is based on errors in tropical-cyclone forecasts made during several recent years. Tables and nomographs are provided for both Atlantic-Caribbean and western North-Pacific areas. They are simple and quick to apply.

Air Weather Service, Washington, D. C.
TROPOPAUSE ANALYSIS AND FORECASTING. Mar 52, 37p. 13 refs. Technical rept. no. 105-86; ATI-162 082.
Order from LC mi$3.00, ph$6.30 PB 139 921

This report outlines a recommended procedure of construction of tropopause charts and tropopause prognostic-charts for guidance of those forecasting detachments which have a requirement for such charts. A discussion of the basis for the recommendations and illustrative examples are included.

Arizona State Coll., Flagstaff.
CORRELATION OF A LONG SERIES OF PRECIPITABLE WATER MEASURES AT THE ATMOSPHERIC RESEARCH OBSERVATORY WITH SURFACE HUMIDITY, by Arthur Adel. Scientific rept. HB-4 on Contract AF 19(604)2177, Apr 58, 24p. AFCRC TN-58-281; AD-152 529.
Order from LC mi$2.70, ph$4.80 PB 135 283

Precipitable water determinations for 746 days are presented in tabular form and treated statistically. The correlation with surface vapor pressure is excellent. The data portray the seasonal march of atmospheric water vapor at Flagstaff, Arizona in Striking fashion.

Arizona State Coll., Flagstaff.
VODARO PARAMETERS, 1953-1957, by Arthur Adel. Scientific rept. HB-5 on Contract AF 19(604)2177. Apr 58, 83p. AFCRC TN-58-282; AD-152 530.
Order from LC mi$4.80, ph$13.80 PB 135 282

Parameters required for the calculation of vertical ozone distributions by the method of VODARO are tabulated for the period July 1953 - June 1957.

Army Signal Research and Development Lab., Fort Monmouth, N. J.
HYGROTHERMOGRAPH SET AN/TNQ-8(), by Edward Leiblein and Joseph A. Siderman. 1 Oct 58, 61p. USASRDL Technical rept. 1986.
Order from LC mi$3.90, ph$10.80 PB 139 843

This report describes the evaluation of equipment designed to remotely measure and record temperature and humidity at a point up to 500 feet from the sensing instruments. Evaluation indicates that as presently designed, it is not suitable for field use as it does not fully meet the established military characteristics and applicable specifications governing its design. Further investigation of the element-housing design, improvement in recording potentiometer accuracy, and improvement in humidity-element design and performance are necessary for the successful completion of this development.

Army Signal [Research and Development Lab.] Fort Monmouth, N. J.
A WIND-NOISE-REDUCTION INSTALLATION FOR SOUND-RANGING MICROPHONES, by William R. Bandeen and George R. Kaschak. 15 Mar 57, 35p. 4 refs. Technical memo. no. M-1864.
Order from LC mi$3.00, ph$6.30 PB 138 468

The frequent occurrence of wind speeds of 15 miles per hour and greater at Fort Churchill, Manitoba, Canada, necessitated the development of a wind-noise-reduction installation for sound-ranging microphones to be used in the rocket-grenade experiment to be conducted by the U. S. Army Signal Engineering Laboratories at Fort Churchill during the International Geophysical Year 1957-1958. Four types of wind-noise-reduction installations were tested under field conditions and compared to the standard military installation using Microphone Shelter BE-66-A. The best of the installations tested utilized an octagonal windscreen with a center baffle plate which gave a wind-noise reduction factor (k) of between 5 and 7 (ratio of amplitudes) compared to the BE-66-A installation at wind speeds of 15 mph. Winds were recorded at anemometer heights of 7 and 14 feet above the ground. A theoretical basis for designing windscreens, the instrumentation used in the experiments, and a theoretical analysis of the windscreen selected for use at Fort Churchill are also discussed.

Blue Hill Meteorological Observatory, Milton, Mass.
METEOROLOGICAL RADAR STUDIES NO. 11: RADAR OBSERVATION OF COLD FRONT THUNDERSTORMS OF 14 JULY 56, by Charles R. Shackford. Rept. on Contract AF 19(604)950. Mar 58, 44p. 9 refs. AFCRC-TN-58-263; AD-152 501.
Order from LC mi$3.30, ph$7.80 PB 135 918

On July 14, 1956 a squall line of intense thunderstorms developing principally in New England before a fast-moving cold front in a conditionally unstable atmosphere, produced severe weather at the surface. It is shown that orographic features were associated with the initial radar echo appearances of the storms. Intensification of the echoes as observed by CPS-9 radar was found to be associated with their combination, passage over specific geographic areas and their abrupt change of course. A qualitative relationship is shown to exist between radar intensification and severe weather at the surface. A negative correlation between echo speed and intensity and a positive correlation between echo speed and height were found to exist.

Blue Hill Meteorological Observatory, Milton, Mass.
STUDY OF SYNOPTIC-DYNAMIC INFLUENCES ON THE NATURE OF CLOUD AND PRECIPITATION ECHOES. Final rept. for Oct 53-Feb 58 on Meteorological Radar Studies, Contract AF 19(604)950. Mar 58, 38p. 9 refs. AFCRC-TR-58-244; AD-152 502.
Order from LC mi$3.00, ph$6.30 PB 134 376

Eleven meteorological studies have been published under this contract. Brief abstracts giving the most significant findings from these studies follow. Two other studies which had not been pursued to a point warranting a complete scientific report are also summarized.

Chicago U., Ill.
AN INVESTIGATION OF THE EXISTENCE OF AN ALEUTIAN LOW SINGULARITY, by Willys D. Wuest. Technical rept. no. 6 on Contract AF 19(604)2179. Aug 58, 13p. 9 refs. AFCRC TR-58-656.
Order from LC mi$2.40, ph$3.30 PB 139 308

The normal five-day isobaric charts prepared by Lahey, Bryson and Wahl (1957) and the daily synoptic charts published by the U. S. Weather Bureau were used to investigate the development of a major singularity in the pressure field which occurs in spring over the northern part of the Pacific Ocean. The cyclone frequency and the cyclone activity were evaluated from the daily synoptic charts, and it was found that a major change in cyclone activity takes place in early April. The so-called Aleutian low then divides itself into two centers, one in the Gulf of Alaska and the other over eastern Asia. The analysis confirms and adds details to the results obtained by Lahey, Bryson and Wahl, who used normal pressure charts.

Cloud Physics Lab., U. of Chicago, Ill.
ON THE MEASUREMENT OF TRUE AIR TEMPERATURE IN CLOUD PHYSICS RESEARCH, by George V. Owens. Technical note no. 13 on Contract AF19(604)1931. Apr 58, 38p. AFCRC TN-58-436; AD-152 609.
Order from LC mi$3.00, ph$6.30 PB 135 254

A review of the principles of aerodynamic heating of ordinary aircraft temperature elements is presented. This shows that the recovery factor is the result of a nonisentropic viscous heating factor, which is constant, and an isentropic cooling factor, which varies with air speed and altitude. The cooling factor results in anomalous indications of true air temperature when a constant recovery factor is used in data reduction. In the application of this concept to the reverse-flow type temperature probe it is found that the temperature element senses the recovery factor of the probe structure.

Florida State U., Tallahassee.
ON THE USE OF HIGH-ALTITUDE CLOUD PHOTOGRAPHS AS A BASIS FOR INFERRING THE DISTRIBUTION OF WIND, TEMPERATURE, PRESSURE AND STABILITY, by Richard M. Negley. Scientific rept. no. 2 on Contract AF 19(604)1754. 15 Aug 58, 41p. 24 refs. AFCRC-TN-58-475.
Order from LC mi$3.30, ph$7.80 PB 137 176

Some suggestions for analyzing high-altitude cloud photographs from rockets are introduced, and the value of these cloud photographs as a supplement to the usual meteorological observations is discussed. The criteria for analysis are chosen with the aim of relating them qualitatively to such parameters as wind, temperature, pressure, and stability. A method for constructing a grid as an aid in space orientation is presented for use with oblique photographs. A case study, based on a two-photograph composite from the U. S. Navy rocket Viking 11, is presented. A grid is constructed for the composite and a cloud analysis is used to infer patterns of wind, temperature, pressure, and stability. Certain qualitative aspects verified favorably while attempts at quantitative measurements were only partially successful.

Institute of Geophysics, U. of California, Los Angeles.
EMPIRICAL STUDY OF AIR MOVEMENT NEAR THE EQUATOR, by J. R. Ballif, C. E. Palmer and others. Final rept. on Contract AF 19(604)2134. Aug 58, 99p. 24 refs. AFCRC TR-58-270.
Order from LC mi$5.40, ph$15.30 PB 139 913

The report consists of an introduction and six chapters, and is concerned with the relation of inertial and frictional forces, acting on atmospheric parcels moving near the equator, to pressure gradient and Coriolis forces. When mean winds, averaged over a period of approximately one month, were studied over the Marshall Islands, it was found that quasi-geostrophic conditions held, even down to 3°N. The report tabulates, for June 1956, the orders of magnitude of the terms in the meteorological equations of motion from the surface to 60,000 feet. It was not possible to evaluate the pressure gradient term above 10,000 feet, owing to radiosonde errors. A study was made of "synoptic" wind profiles at individual stations in the belt 5°N to 5°S. An explanation was attempted in terms of the effect cumulus clouds might have on the vertical exchange of momentum. As by-products of the investigation, some new results on the mean vertical velocities near the equator were obtained. The results seem to confirm the existence of a Hadley circulation over the Marshalls. Another by-product of the work is the discovery that long-period (greater) than one year) changes in the stratospheric zonal wind occur over the equator.

Ionosphere Research Lab., Pennsylvania State U., University Park.
IONOSPHERIC ELECTRON DENSITIES FOR WASHINGTON, D. C., PANAMA, TALARA AND HUANCAYO, NUMBER 1, JULY 1957, by E. R. Schmerling. Scientific rept. no. 105 on Ionospheric Research, Contract AF 19(604)1304. 15 July 58, 86p. 3 refs, AFCRC-TN-58-442; AD-152 618.
Order from LC mi$4.80, ph$13.80 PB 135 544

McGill U. (Canada).
SYNOPTIC REGIMES IN THE LOWER ARCTIC TROPOSPHERE DURING 1955, by C. V. Wilson. Scientific rept. no. 6 on Contract AF 19(604)1141. Mar 58, 111p. 27 refs. Arctic Meteorology Research Group Pub. in Meteorology no. 8; AFCRC TN-58-249; AD-152 484.
Order from LC mi$6.00, ph$18.30 PB 137 683

The progression of large synoptic systems (sea-level) over the Arctic (1955) is analysed by computing a persistence function. Generally high stability was apparent throughout the year, with a tendency for high persistence to be maintained during periods averaging

six days. Such runs alternated with abrupt large-scale reorganisations. Two regimes were distinguished:- (i) winter-spring, where the degree of persistence was consistently high, with a tentative 14-15 day period, followed by a sharp June change to (ii) a summer-autumn regime when conditions were generally less stable and changes less well defined. The return to winter conditions was gradual. Fourteen days after sudden increases in geomagnetic activity a marked decrease was found in the persistence function. Synoptic checks brought to light two interesting cases of sudden reversals of pattern coincident with these dates.

MacDonald Physics Lab., McGill U. (Canada).
STUDIES OF ALBERTA HAILSTORMS, 1957, by Richard H. Douglas and Walter Hitschfeld. Rept. on Contract AF 19(604)2065. May 58, 83p. 5 refs. Scientific rept. MW-27; AFCRC-TN-58-413; AD-152 578.
Order from LC mi$4.80, ph$13.80 PB 135 625

The Alberta project was planned as a study of the basic physics of the hailstorm, not as an experiment in suppression; it was designed for the collection and study of basic data on hailstorms, for the immediate purpose of furthering the knowledge of the fundamental physics of the cloud - and precipitation - processes involved.

Massachusetts Inst. of Tech., Cambridge.
INTEGRATION OF FOUR-LEVEL PROGNOSTIC EQUATIONS OVER THE HEMISPHERE, by H. L. Kuo and Jack Nordö. Scientific rept. no. 2 on General Circulation Proj., Contract AF 19(604)2242. July 58, 36p. 4 refs. AFCRC TN-58-443; AD-152 635.
Order from LC mi$3.00, ph$6.30 PB 136 485

The three-dimensional quasi-nondivergent prognostic equation derived previously by Kuo is integrated over the hemisphere, the vertical distribution being represented by four levels. The effects of the mean radiational heating, friction and heating from the ground, and that of the turbulent diffusion have been included in this investigation. The initial disturbance considered is a random combination of ten wave components in x and seven wave components in y. The result of the integration is that at the end of the fourth day at 850 mb, three closed lows have been formed, all around latitude 60°, while the pole is occupied by a high. These lows have the dimensions of the semi-permanent lows in winter.

Ohio State U. Research Foundation, Columbus.
FIELD TEST OF DIRECTIONAL SCINTILLOMETER, by Roger Hosfeld and J. Allen Hynek. Scientific rept. 1 on Contract AF 19(604)2039. Sep 57, 26p. AFCRC TN-57-237; AD-133 815.
Order from LC mi$2.70, ph$4.80 PB 135 185

A specialized telescope utilizing a rectangular section of a parabolic mirror was used to make stellar scintillation observations for correlation with simultaneous winds aloft. Relatively good agreement was found between the azimuthal orientation of the rectangular mirror and the wind direction throughout the region from 3 or 4 km to 17 or 18 km. For winds at both lower and higher levels the agreement was poor.

Geodesy

Aeronautical Chart and Information Center, St. Louis, Mo.
COMPUTATION OF SHORAN DISTANCE. Sep 57, 96p. 51 refs. ACIC Technical rept. no. 76.
Order from LC mi$5.40, ph$15.30 PB 139 981

This report is concerned with computations of the distances between shoran ground stations and the airborne shoran transmitter receiver. It takes account of such parameters as the height of the aircraft above the earth and the curve of the electronic wave path in the atmosphere; however, it does not consider other elements of the bombing problem such as ballistic trajectories, wind velocity, etc.

Mapping and Charting Research Lab., Ohio State U. Research Foundation, Columbus.
AERIAL TRIANGULATION BY LEAST SQUARES, by A. Brandenberger and S. Laurila. Final rept. for 1 July-30 Sep 56 on Contract DA 44-009-eng 2638. Apr 57, 142p. 9 refs. AD-140 062.
Order from LC mi$7.20, ph$22.80 PB 135 936

The object of this research is to study the question of possible improvement of instrumental aerial triangulation by applying a numerical least squares adjustment based upon residual y-parallaxes measured in each stereomodel. The results obtained show that the strip triangulations by means of instrumental relative orientation and instrumental model connection are more accurate, less time consuming, and more economical than the strip triangulations with the numerically adjusted relative orientation and succeeding numerical model connection (least squares solution).

Mapping and Charting Research Lab., Ohio State U. Research Foundation, Columbus.
DESIGN FOR A NAVIGATIONAL CHART FOR LONG LOW-ALTITUDE FLIGHTS AT HIGH SPEEDS, by O. M. Miller. Rept. on Contract AF 33(616)2378. Jan 57, 59p. Technical paper no. 205; RADC TN-57-139; AD-114 413.
Order from LC mi$3.60, ph$9.30 PB 135 336

In Section I various assumptions are made concerning long low-altitude high-speed flight missions. A principal one is that navigation will be primarily by dead reckoning rather than by visual piloting. In order to check the accuracy of this dead reckoning, check points on the ground must be used. In Section II concepts of the outer limits of recognition, the inner limits of visibility, and the optimum viewing points of check points are developed systematically and are given tentative numerical definitions as means for setting up selection standards. Problems concerning the field of view of the pilot are also treated. In Section III a design for a chart for the type of flight mission under discussion is explained and illustrated. The elimination of all background detail and the

haracterization of check points on the margins of the hart are special features. In Section IV the need for areful planning of the flight path involving special lanning charts is emphasized. Desirable character- tics of these planning charts are outlined, and uggested procedures for compiling the navigational hart from them are given.

Naval Photographic Interpretation Center, Washington, D. C.
EIGHT DETERMINATION OF VERTICAL OBJECTS ON THE OBLIQUE PHOTOGRAPH, by G. T. McNeil. 29 Aug 50, 7p. 2 refs. Technical Bulletin no. 123-50.
Order from LC mi$1.80, ph$1.80 PB 139 979

A very simple formula and a fictitious example are presented to demonstrate the solution for determining the height of vertical objects on an oblique photograph. The required date are: (a) focal length of camera, (b) altitude of aircraft, (c) apparent horizon, and (d) fiducial marks to locate principal point. The method may be utilized, when the scale of the oblique photography permits such utilization, by photogrammetrists and photo interpreters who require the heights of vertical objects.

Mineralogy

Harvard U., Cambridge, Mass.
INVESTIGATION INTO EFFECTS OF RADIATION ON THE PHYSICAL PROPERTIES OF QUARTZ, by Clifford Frondel. Quarterly rept. no. 1, 1 July-30 Oct 51, on Contract DA 36-039-sc-15350. [1951] 9p.
Order from LC mi$1.80, ph$1.80 PB 140 054

A survey of the existing literature on effect of composition on physical properties of quartz.

Harvard U., Cambridge, Mass.
INVESTIGATION INTO EFFECTS OF RADIATION ON THE PHYSICAL PROPERTIES OF QUARTZ, by Clifford Frondel. Quarterly rept. no. 3, 30 Jan-30 Apr 52, on Contract DA 36-039-sc-15350. [1952] 7p.
Order from LC mi$1.80, ph$1.80 PB 140 053

Emphasis was placed on precision measurements of the indices of refraction of natural and of artificially irradiated quartz, and on the precision x-ray measurement of the unit cell dimensions of quartz. An x-ray powder camera of a new design has been constructed. (See also PB 140 054)

Oceanography

Washington U., Seattle.
PHYSICAL AND CHEMICAL DATA, NORTH PACIFIC OCEAN, by Richard H. Fleming. Special rept. no. 29 on Brown Bear Cruise 176, July-Sep 57, for the International Geophysical Year of 1957-1958, Contracts Nonr-477(10) and Nonr-477(01). June 58, 113p. 6 refs. Ref. 58-22.
Order from LC mi$6.00, ph$18.30 PB 139 858

The major objectives of the cruise, in terms of the IGY program were: (a) To obtain detailed observations from the deep waters, including those in the Aleutian Trench (b) To determine, if possible, the nature of the water exchange between the Northern Pacific and the Bering Sea. Detailed observations of temperature and salinity were made at eight stations. A variety of chemical analyses were made. In addition, water samples were collected for age-dating by carbon-14 techniques; biological samples were collected with plankton nets and a midwater trawl; productivity was measured using the carbon-14 method.

Woods Hole Oceanographic Institution, Mass.
OCEANOGRAPHIC DATA FROM CRAWFORD CRUISE 16, 1 OCT-11 DEC 1957 FOR THE INTERNATIONAL GEOPHYSICAL YEAR OF 1957-58, by W. G. Metcalf. Rept. on Contract Nonr-2196(00). June 58, 155p. 10 refs. Ref. no. 58-31.
Order from LC mi$7.50, ph$24.30 PB 140 110

Physics of the Atmosphere

Arizona State Coll., Flagstaff.
COMPARISON OF THE NET RADIATION LOSSES BY THE EARTH'S SURFACE IN THE SPECTRAL REGION 5 MU - 14 MU - 24 MU, by Arthur Adel. Scientific rept. HB-3 on Infrared Spectroscopy of the Sun, Moon, and Earth. 7 Apr 58, 14p. AFCRC-TN-58-280; AD-152 528.
Order from LC mi$2.40, ph$3.30 PB 135 284

The net radiation loss by the earth's surface (thermocouple receiver) in the spectral region 5 microns - 24 microns has been measured on thirty-three occasions. At Flagstaff, Arizona the energy loss in the region 14 microns - 24 microns reaches values in excess of 30% of the energy loss in the region 5 microns - 14 microns.

Arizona State Coll., Flagstaff.
PRELIMINARY STUDY OF THE SEASONAL TRENDS OF ATMOSPHERIC MINOR CONSTITUENTS, by Arthur Adel. Scientific rept. HB-1 on Contract AF 19(604)2177. Mar 58, 58p. AFCRC TN-58-244; AD-152 479.
Order from LC mi$3.60, ph$9.30 PB 135 281

Numerous observations of the absorption of solar radiation by the minor constituents of the earth's atmosphere have been made at the Atmospheric Research Observatory, Flagstaff, Arizona. The measurements are sufficiently widespread in time to permit a preliminary investigation of seasonal behavior. Nitrous oxide, methane, and carbon dioxide are found to be sensibly constant. HDO is compared in its seasonal absorption with that of H_2O.

Armour Research Foundation, Chicago, Ill.
MEASUREMENT OF ATMOSPHERIC INFRARED TRANSMISSIONS, by A. Lieberman. Rept. no. 1 (Final). 1 Aug-31 Dec 56 [on Contract AF 30(602)-1400]. 31 Jan 57, 54p. 10 refs. RADC TR-57-82; AD-114 458.
Order from LC mi$3.60, ph$9.30 PB 139 956

The Armour Research Foundation Particle Counter was used to obtain atmospheric particle size distribution and concentration data. The data were supplied to the Chicago Midway Laboratories for correlation with infrared transmission measurements made by their personnel. Independent measurements of particle size distribution and concentration were made by use of a cascade impactor and by millipore filters. These data were obtained in Chicago, Illinois in August and December 1956 and in Colorado Springs, Colorado in September 1956. Descriptions are given of the sampling and counting devices used, and the data are discussed. The particle counter size and concentration data are tabulated for easy reference.

Army Signal Research and Development Lab., Fort Monmouth, N. J.
THE IONOSPHERIC FARADY EFFECT AND ITS APPLICATIONS, by F. B. Daniels and S. J. Bauer. 22 June 58, 29p. 8 refs. USASRDL Technical rept. 1980.
Order from LC mi$2.70, ph$4.80 PB 139 078

An outline is given of the theory of the ionospheric Faraday effect (the rotation of the plane of polarization of radio waves by the ionosphere). Measurements of ionospheric characteristics by means of lunar radio reflections and radio transmissions from artificial satellites utilizing this effect are discussed. The rate of fading of satellite signals due to the Faraday effect is found to depend upon both the integrated electron density up to the height of the satellite and the local electron density at the satellite. Thus, a possiblity exists of determining both quantities provided the satellite transmissions are received simultaneously by two or more stations. Expressions for the fading rate are derived and the effects of orbital parameters on the determination of ionospheric characteristics are discussed.

California U., Los Angeles.
ON THE COUPLING BETWEEN SHEARING INSTABILITY AND A CONTINUOUSLY DISTRIBUTED STATIC STABILITY, by C. L. Godske. Scientific rept. no. 1 on Dynamics of Simple Atmospheric Flow, Contract AF [19] (604)1377. Sep 57, 18p. 7 refs. AFCRC TN-57-603; AD-133 837.
Order from LC mi$2.40, ph$3.30 PB 134 493

General wave motions are generated by a combination of compressibility effects, static stability effects, and dynamic effects. The present paper neglects compressibility and among the dynamic effects only considers the finite shearing acting at a surface of discontinuity in velocity.

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
STUDIES ON PROPAGATION IN THE IONOSPHERE, by H. G. Booker, B. Nichols and others. Progress rept. no. 1 on Contract DA 36-039-sc-74903. 31 Dec 57, 21p. 5 refs. Research rept. EE 356.
Order from LC mi$2.70, ph$4.80 PB 135 965

The advent of satellites has made possible the determination of the height of scintillation by measurements made of radiation from a CW source at various levels in the F region. A new attempt to explain spread F, based on the idea of columns of ionization along the earth's magnetic field, has been made.

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
STUDIES ON PROPAGATION IN THE IONOSPHERE, by H. G. Booker, B. Nichols and others. Progress rept. no. 2 on Contract DA 36-039-sc-74903. 31 Mar 58, 26p. 4 refs. Research rept. EE 373.
Order from LC mi$2.70, ph$4.80 PB 135 964

The C-2 ionospheric sounder has been received and installed. It is now in working order. Experimental work on spread F has been slowed by the departure of W. Klemperer. Work is however continuing. Interesting echoes from a roughly northerly direction have been obtained, using a radar equipment at 13.96 Mc/s. The directions of arrival of these echoes are being measured in azimuth and angle of elevation. Results seem promising. A report is being prepared on measurements of the fading of WWV. It is believed that part of the fading observed at Ithaca involves backscattering from ionization to the north. (See also PB 135 965)

Institute of Mathematical Sciences, New York U., N. Y.
SHEAR WAVES IN STRATIFIED ROTATING LIQUIDS, by Sherman C. Lowell. Rept. on Contract AF 19(604)2265. July 58, 28p. 9 refs. IMM-NYU 251; AFCRC TN-58-484.
Order from LC mi$2.70, ph$4.80 PB 137 692

Ionosphere Research Lab., Pennsylvania State U., University Park.
AERONOMIC CONDITIONS IN THE MESOSPHERE AND LOWER THERMOSPHERE, by M. Nicolet. Scientific rept. no. 102 on Ionospheric Research, Contract AF 19(604)1304. Apr 58, 95p. 66 refs. AFCRC-TN-58-400; AD-152 550.
Order from LC mi$5.40, ph$15.30 PB 135 234

This report outlines a study of the aeronomy of the atmosphere between 50 and 100 km. After an analysis of the pressure measurements below 100 km, a reasonable model showing that there is a deep temperature minimum at the mesopause is presented. The calculations are based upon experimental data obtained from recent observations with American and Soviet rockets.

Ionosphere Research Lab., Pennsylvania State U., University Park.
DETERMINATION OF SCHMERLING COEFFICIENTS BY DIGITAL COMPUTER TECHNIQUES INCLUDING TABULATED VALUES FOR MAGNETIC DIP ANGLES BETWEEN 0° AND 80°, by C. A. Ventrice and E. R. Schmerling. Scientific rept. no. 106 on Ionospheric Research, Contract AF 19(604)1304.

July 58, 41p. 6 refs. AFCRC-TN-58-464; D-160 740.
Order from LC mi$3.30, ph$7.80 PB 135 878

A digital computer program is developed for the computation of coefficients by means of which h'-f records may be readily reduced to N-h profiles without further computational aids. Full account is taken of the earth's magnetic field, and no special layer-shapes are assumed. Tables of these coefficients are computed, valid over most of the earth except where the magnetic dip exceeds 80°. The accuracy of the coefficients and their sensitivity to the magnetic field parameters are discussed. Conclusions are drawn, from actual examples, concerning the use of the tables, and the overall accuracy which may be expected in their use.

Ionosphere Research Lab., Pennsylvania State U., University Park.
TABULATION OF GROUP HEIGHT, PHASE HEIGHT AND NON-DEVIATING REGION ABSORPTION AT VARIOUS LOW FREQUENCIES FOR A NUMBER OF MODELS OF THE LOWER IONOSPHERE, by A. C. Aikin. Scientific rept. no. 101 on Ionospheric Research, Contract AF 19(604)1304. Mar 58, 104p. AFCRC TN-58-441; AD-152 617.
Order from LC mi$5.70, ph$16.80 PB 135 255

Methods for obtaining group height, phase height and non-deviative absorption are outlined. These methods are then applied to fifty reasonable electron density profiles. Tables of the resulting group and phase heights and non-derivative absorption are given for frequencies of 75 kc/sec, 150 kc/sec, 300 kc/sec and 600 kc/sec. The application of the models to sunrise effects is discussed.

Johns Hopkins U., Baltimore, Md.
THE INFRARED ATMOSPHERIC TRANSMISSION PROBLEM, by John Strong. Rept. on Contract N5ori-166(05). Aug 48, 11p. ATI-169 705.
Order from LC mi$2.40, ph$3.30 PB 136 100

Presented at the Symposium on Molecular Structure and Spectroscopy, 15 June 48.

Massachusetts Inst. of Tech., Cambridge.
STUDY OF THE DIFFUSION OF GASES OR AEROSOLS IN THE LOWER ATMOSPHERE, by H. E. Cramer, F. A. Record, and H. C. Vaughan. Final rept. on Contract AF 19(604)3460. 15 Jan 59, 90p. 13 refs. AFCRC-TR-59-207; AD-210 482.
Order from LC mi$4.80, ph$13.80 PB 139 914

Past field studies of small-scale diffusion processes provided comprehensive information on the structure of gas plumes from a continuous point source located near ground level, over travel distances of the order of 1 km, for sampling times from 0.5 to 10 min. Additional concentration measurements of this type for extremely short sampling times of the order of 1 sec were clearly required. The second section of the report provides a complete account of the development of an automatic data-handling and data-collection system designed to facilitate the rapid sampling of meteorological parameters and the presentation of results in convenient form.

Michigan U. Research Inst., Ann Arbor.
ON THE USE OF IONIZATION-GAGE DEVICES AT VERY HIGH ALTITUDES, by N. W. Spencer and R. L. Boggess. Final rept. on Contract AF 19(604)1890. Jan 58, 18p. 16 refs. 2534-1-F; AFCRC TR-58-221; AD-152 499.
Order from LC mi$2.40, ph$3.30 PB 135 229

The use of an ionization-gage—omegatron combination in rockets and satellites at very high altitudes is considered. Appropriate instrumentation employing these devices is believed to offer good possibilities for the measurement of atmospheric pressure, temperature, density, and composition.

New Mexico U., Albuquerque.
CHEMICAL TELEMETERING SONDE FOR BALLOON SOUNDINGS OF ATMOSPHERIC OZONE. Scientific rept. no. 1 on Contract AF 19(604)1950. 26 Dec 57, 48p. 3 refs. AFCRC TN-58-271; AD-152 517.
Order from LC mi$3.30, ph$7.80 PB 138 500

Toronto U. (Canada).
GEOMAGNETIC PULSATIONS AND THE EARTH'S OUTER ATMOSPHERE, by J. A. Jacobs and T. Obayashi. Scientific rept. no. 5 on Contract AF 19(604)2147. 19 Aug 57, 21p. 16 refs. AFCRC-TN-57-236; AD-133 813.
Order from LC mi$2.70, ph$4.80 PB 135 592

Hydromagnetic oscillations of the earth's ionized outer atmosphere along the geomagnetic lines of force are considered. The observational evidence of world-wide geomagnetic pulsations yields the distribution of ionic density in the outer atmosphere extending beyond the ionosphere. It is found that the ion density is about 10^3 per cm^3 at a distance of a few earth radii decreasing exponentially to a value of the order of 3 to 5 per cm^3 in the interplanetary space. A theoretical consideration on the temperature of the outer ionosphere is also discussed.

ENGINEERING

Department of Defense, Washington, D. C.
ADVANCED ENERGY SOURCES AND CONVERSION TECHNIQUES. Proceedings, Vol. 1, of a Seminar held 3-7 Nov 58 at Pasadena, Calif. Nov 58, 256p. AD-209 301.
Order from OTS $4.00 PB 151 461

Contents:
Introduction
Immediate and future energy needs of the military services
Fundamental principles of energy processes
Energy conversion techniques and devices--chemical
Energy conversion techniques and devices--thermal
Energy conversion techniques and devices--solar
Energy conversion techniques and devices--nuclear
Energy conversion techniques and devices--electrical and mechanical
Other energy sources and interchange mechanisms
Energy systems for remote locations and space applications

Aeronautical Instruments Lab., Naval Air Development Center, Johnsville, Pa.
TEST AND EVALUATION OF KOLLSMAN INSTRUMENT CORPORATION LOW TRUE AIRSPEED TRANSDUCER FOR HELICOPTERS, by M. J. Moran. Final rept. on Proj. TED ADC AE-7384.5. 4 June 57, 20p. 2 refs. Rept. no. NADC-AI-5709.
Order from LC mi$2.40, ph$3.30 PB 137 299

The Kollsman low true airspeed transducer for helicopters was evaluated in the laboratory in accordance with BuAer contractual details for project TED ADC AE-7384.5. When subjected to laboratory tests under various temperatures and pressures corresponding to various altitudes, the low true airspeed transducer functioned satisfactorily, except at a pressure altitude of -1000 feet at temperatures of -20, +20 and +40 degrees centigrade. The synchrotel rotation errors increased as a result of the vibration tests. The low true airspeed transducer is considered satisfactory for service use after remedial action by the manufacturer.

Aeronautical Materials Lab., Naval Air Material Center, Philadelphia, Pa.
SANDWICH CONSTRUCTION- FLEXURAL AND SHEAR TESTS OF STIFFENED FLAT PANELS, by James F. O'Brien. Rept. for 8 Mar-25 June 45. 6 Nov 45, 16p. 6 refs. NAES rept. no. AML NAM-2408, Pt. 8.
Order from LC mi$2.40, ph$3.30 PB 140 244

Shear properties of alclad-face and fiberglasface sandwich panels are somewhat inferior respectively to similar properties of conventional 24S-T alclad and OC-64 fiberglas sheet construction.

Air Research and Development Command, Washington, D. C.
ARDC PRODUCTION DESIGN HANDBOOK, by John I. Thompson and Co. Rept. on Contract AF 18(600)1789. Dec 58, 271p. 80 refs. ARDC TR-59-1; AD-204 500.
Order from OTS $4.00 PB 151 724

The objective of this effort is to provide a designer's reference manual. Each metal forming process is covered in a separate chapter which describes the following points: basic process, various production methods, production equipment, advantages and limitations, suitability of various metals, production quantities and economics involved, design considerations, usual dimensional tolerances, surface finishes obtainable. Contents include: forging, extrusion, contour rolling, drawing, spinning, rubber forming, stretch forming, stamping, rolling, casting, powder metallurgy, heat treatment, soldering, brazing, welding, surface finish, surface cleaning, surface treatment, non-destructive testing, chemical milling, glossary, and index.

Airborne Instruments Lab., Inc., Mineola, N. Y.
TRANSISTORIZED MTI CANCELER. Interim engineering rept. no. 1, July 57-Jan 58, on Contract AF 30(602)1705. Feb 58, 14p. 3 refs. Rept. no. 4520-I-1; RADC-TN-58-104; AD-148 690.
Order from LC mi$2.40, ph$3.30 PB 135 606

The design and performance of 20-Mc carrier and trigger generator circuits that form component units of the MTI canceler equipment are described.

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
THE DEVELOPMENT OF DYNAMIC FLIGHT SIMULATION, by James D. Hardy and Carl C. Clark. Rept. no. 1 on Proj. NM 11 02 12.6. 4 Dec 58, 21p. 1 ref. NADC-MA-5817.
Order from LC mi$2.70, ph$4.80 PB 139 878

The adaptation of the 50-foot human centrifuge to the demands of closed loop simulation and the computer control involved are explained. Also discussed is the role played by dynamic flight simulation in the training of pilots to fly the X-15 Research Aircraft.

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
ARTIFICIAL STABILITY AND CONTROL OF LONGITUDINAL MOTION OF THE B-26 AIRCRAFT: THEORETICAL INVESTIGATION, by Frank W. Heilenday. Rept. on Contract AF 33(038)20659. Nov 51, 84p. 11 refs. AF Technical rept. no. 6703; ATI-156 238.
Order from LC mi$4.80, ph$13.80 PB 140 361

The longitudinal flying qualities of the B-26 airplane were investigated theoretically in order to provide artificial control over the period and damping of the phugoid and short period oscillations and over the stick motion and force per g or speed change. An auxiliary pitching control surface of 3.48 sq. ft. is necessary to provide the desired range of phugoid control. It is concluded that a wide range of flying qualities can be provided to the B-26 with electro-hydraulic systems governing the elevator and the control stick motions and an electric servo motor governing the auxiliary surface deflection.

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
FLIGHT EVALUATIONS OF THE EFFECT OF VARIABLE SPIRAL DAMPING IN A JTB-26B AIRPLANE. Final rept. on Contract NOa(s)56-793-c. 19 Oct 57, 91p. 8 refs. Rept. no. TB-1094-F-1.
Order from LC mi$5.40, ph$15.30 PB 136 280

A JTB-26B airplane was modified to permit in-flight variation of spiral stability over a wide range. Qualitative evaluations by two pilots of the relative acceptability of various spiral configurations were obtained for both instrument and contact type flying. A limited amount of quantitative data was obtained for the instrument flying. The data obtained show that spiral stability has a definite effect on the performance of the pilot-airplane system and that, though higher values of stability than inherent in present day aircraft are not mandatory, they are certainly desirable.

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
PROPOSED TEST APPARATUS FOR SMALL ROTOR-

RAFT: VOLUME II, by Edward M. Sullivan. Rept. n Contract DA 44-177-tc-440. Apr 58, 76p. 9 refs. ept. no. SG-1195-S-2; AD-201 771.
rder from LC mi$4. 50, ph$12. 30 PB 136 564

his report discusses in detail the design studies that ere conducted to determine the feasibility of con- tructing an apparatus to be used to determine the tatic and dynamic flying characteristics of small otorcraft. The results of these studies indicated that reliable and versatile experimental apparatus could e constructed with which accurate aerodynamic data n small rotorcraft could be obtained.

Directorate of Flight and All-Weather Testing, Wright-Patterson AFB, Ohio.
UNWAY DISTANCE MARKERS, by Clayton S. offman. Rept. on Evaluation of Experimental Runway istance Markers, 6 Mar-26 Apr 57. May 57 [32]p. ADC TN-57-142; AD-118 208.
rder from OTS $1. 00 PB 131 217

The purpose of this test program was to determine which type of runway distance marker would be ade- quate to assist pilots in determining their longitudinal position on the runway during takeoffs and landings and to formulate criteria for the design and installation of a suitable runway distance marker for all USAF air- fields. In determining the optimum marker design, tests conducted on eleven runway distance markers of various sizes, colors, and light combinations. The lighted 5-ft square black marker with a white numeral and border was optimum for day and night operations. Runway distance markers, to be effective, must be located as close to the runway edge as can safely be allowed and must be lighted for night operations. Markers should be located on each side of the runway, spaced at 1000-ft intervals, and indicate runway re- maining. Markers should be as high off the ground as can safely be allowed and should be at an angle with the runway.

Fluidyne Engineering Corp., Minneapolis, Minn.
GUST ALLEVIATION STUDY. PART I. ESTIMATION OF THE CONTROL DERIVATIVES FOR FLAPS, SPOILERS, AND OTHER CONTROL DEVICES IN- TENDED FOR USE AS GUST ALLEVIATORS, by Arthur L. Jones, Alfred E. Cronk and others. Rept. on Engineering Analyses of Wing Installed Aerodynamic Devices for Gust Alleviation, Contract AF 33(616)2094. Jan 58, 203p. 74 refs. WADC Technical rept. 57-750, Pt. 1; AD-208 143.
Order from OTS $3.50 PB 151 710

This is the first part of a three-part report presenting the results of an investigation made to determine the feasibility of using wing installed aerodynamic devices for gust alleviation. In this part, the aerodynamic characteristics of wing-mounted control devices which might be used for gust alleviation have been investi- gated. Of the controls given preliminary consideration, only trailing-edge flaps, mechanical spoilers, air-jet spoilers, and streamwise wing slots were sufficiently promising to warrant detailed examination. The characteristics estimated included the static lift, pitching-moment, drag, and downwash derivatives with respect to control operation, and the control indicial lift responses, which include the aerodynamic lag ef- fects. The aerodynamic and geometric variables in- vestigated included Mach number, aspect ration, taper ratio, sweepback, spanwise location, chordwise loca- tion, thickness ratio, and trailing-edge angle.

Fluidyne Engineering Corp., Minneapolis, Minn.
GUST ALLEVIATION STUDY. PART III. PREDIC- TION OF THE ALLEVIATION OF GUST LOADS ON A RIGID RESTRAINED WING UTILIZING WING INSTALLED ALLEVIATOR DEVICES, by Arthur L. Jones, Charles D. Christopherson, and Douglas C. Nichols. Rept. on Engineering Analyses of Wing In- stalled Aerodynamic Devices for Gust Alleviation, Contract AF 33(616)2094. Jan 58, 188p. 14 refs. WADC Technical rept. 57-750, pt. 3; AD-208 145.
Order from OTS $3. 00 PB 151 713

In this part the percent alleviations of a sharp-edged and one-minus-cosine gust loads on rigid, restrained wings have been calculated using trailing-edge flaps, mechanical spoilers, air-jet spoilers, and streamwise slots as alleviator devices. Frequency response re- sults also were obtained for the wing gust loads using a sinusoidal gust and for the flap and spoiler counter loads. The relative power requirements of each alle- viator device considered were estimated. On the basis of the results obtained, mechanical spoilers and the trailing-edge flaps were rated as feasible controls to be used in gust load alleviation, the air-jet spoilers were rated questionable due to the excessive power requirements indicated, and the streamwise slots were rated questionable due to their relatively low and un- certain aerodynamic effectiveness. (See also PB 151 710)

Fluidyne Engineering Corp., Minneapolis, Minn.
GUST ALLEVIATION STUDY. PART IV. ESTIMATED INDICIAL LIFT RESPONSES OF FLAP AND SPOILER CONTROL DEVICES AT SUBSONIC SPEEDS, by Arthur L. Jones and Charles B. Christopherson. Rept. on Engineering Analyses of Wing Installed Aerodynamic Devices for Gust Alleviation, Contract AF 33(616)2094. Jan 58, 23p. 7 refs. WADC Technical rept. 57-750, Pt. 4; AD-208 146.
Order from OTS $0.75 PB 151 714

Methods of obtaining the indicial responses of flap type and spoiler type lift control devices in subsonic com- pressible flow are described, and results are presented for several typical cases. The flap responses were de- rived within the framework of two-dimensional sub- sonic, linearized, compressible flow theory by the ap- plication of a reverse flow theorem to results previ- ously derived for complete airfoils. The spoiler re- sponses were estimated on the basis of the flap theory and experimental data. In deriving the spoiler re- sponses, the response of the limiting case of a flap of zero flap chord ratio was determined and assumed to be representative of a trailing edge spoiler. The response for this case was then modified by the addition of dead time lags, which correspond to chorwise spoiler loca- tions other than the trailing edge. These dead time lags were derived from experimental data. (See also PB 151 713)

Guggenheim Aeronautical Lab., Calif. Inst. of Tech., Pasadena.
THEORETICAL AND EXPERIMENTAL EFFECT OF SWEEP UPON THE STRESS AND DEFLECTION DISTRIBUTION IN AIRCRAFT WINGS OF HIGH SOLIDITY. PART 7. AN EXPERIMENTAL INVESTIGATION OF THE STRESSES AND DEFLECTIONS IN A SERIES OF CANTILEVER SECTORS OF UNIFORM THICKNESS, by M. L. Williams, J. Garrett, and W. E. Henry. Rept. for Apr 47-June 49 on Contract W33-038-ac-16961. Nov 50, 71p. 3 refs. AF Technical rept. no. 5761, Part 7; ATI-89 541.
Order from LC mi$4.50, ph$12.30 PB 135 121

This report deals with the deflections of sectors of uniform thickness from the standpoint of experimentally determined influence coefficients. A family of sectors having opening angles ranging from 30 to 180 degrees will be considered.

Kelsey-Hayes Co.
APPROXIMATE AIRFRAME TRANSFER FUNCTIONS AND APPLICATION TO SINGLE SENSOR CONTROL SYSTEMS, by Irving L. Ashkenas and Duane T. McRuer. Rept. on Contract AF 33(616)3906. June 58, 236p. 10 refs. WADC Technical rept. 58-82; AD-151 025.
Order from OTS $3.50 PB 151 718

Approximations to longitudinal and lateral rigid-body, level-flight airframe transfer function factors are derived and presented in tabular form. These derivations are largely based on the use of a servo analysis method which can be made exact. The approximate factors are shown to correspond to exact factors for certain simplified sets of the airframe equations of motion; and the physical implications of this correspondence are explored. The approximate transfer function poles and zeros are related to fundamental stability and control quantities; and relative magnitudes for the poles and zeros of interesting transfer functions are established by an analysis of probable values for these quantities. The influence of airframe configuration changes on pole-zero arrangements is shown, and the effect of various arrangement possibilities on closed-loop operation is demonstrated using appropriate servo-analysis techniques. The results and methods used have direct application to the integrated design of airframe-flight control systems.

National Aeronautical Establishment (Canada).
FLOW ABOUT AEROFOILS WITH SPLIT FLAPS WITH APPLICATION TO CIRCULATION CONTROL BY SUCTION, by L. G. Whitehead, F. Cheers, and P. Mandl. Apr 58, 89p. 7 refs. Lab. rept. LR-226.
Order from LC mi$4.80, ph$13.80 PB 135 820

Part I of this report deals with the transformation of an aerofoil with a split flap into a circle for the two cases of zero and finite thickness. The theory is then used to calculate the lift obtained from a source placed in the angle between flap and aerofoil. Part II extends the theory of Part I and applies it to the problem of suction as a means of circulation control. Formulae for lift, moment and centre of pressure location are derived and presented graphically as functions of incidence and flap setting. These are applied to an aerofoil with a split trailing edge flap for which systematic tests with suction have been carried out. The calculated lift coefficients, although indicating the correct trends in regard to changes in the major variables, were found to be consistently larger than the corresponding experimental values.

Polytechnic Inst. of Brooklyn, New York
FAVORABLE INTERFERENCE OF A BODY AND BIPLANE COMBINATION IN SUPERSONIC FLOW, by Lu Ting. Rept. on Contract AF 49(638)445. Mar 59, 11p. 3 refs. PIBAL rept. no. 510; AFOSR TN-59-200; AD-211 526.
Order from LC mi$2.40, ph$3.30 PB 140 026

An optimum contoured prismatic body mounted on a triangular midwing is compared with the combination of the same body with a biplane arrangement of a triangular high wing and low wing.

Rensselaer Polytechnic Inst., Troy, N. Y.
ELECTROMAGNETIC SHIELDING PRINCIPLES. VOL. I, by John P. Quine, Howard Q. Tolten and others. Final rept. on An Investigation of Interference from Radar Modulators, Contract AF 30(602)401. 1 Mar 56, 193p. 15 refs. RADC TR-56-43A; AD-91 297.
Order from LC mi$8.70, ph$30.30 PB 140 372

Contents:
Chapter 1 - General information on interference measurements
Introduction
The nature of interference fields
The sensitivity of rod and loop pickup antennas
Loop receiving antennas
Rod antennas for measuring the electric field
Interference measurements inside screened rooms - correlation with free space measurements
The response of receivers to impulse interference - the concept of microvolts per kilocycle bandwidth
Chapter 2 - Electromagnetic leakage from apertures in equipment cabinets
Introduction
Definition of cabinet attenuation - the concept of "far" attenuation
Electromagnetic scaling principles
The attenuation of cabinets with "naked" apertures
The polarizabilities of apertures
The added attenuation obtained when apertures are covered with screening material
Chapter 3 - Electromagnetic leakage from seams in equipment cabinets
Introduction
Types of seams encountered in practice
The definition of the leakage parameters
The measurement of seam ohm-meters
The relation between seam ohm-meters and cabinet attenuation

Rensselaer Polytechnic Inst., Troy, N. Y.
EXPLORATORY EXPERIMENTAL STUDY OF A NEW METHOD OF ENERGY EXCHANGE BETWEEN STEADY FLOWS, by William J. Guman. Rept. on Contract AF 18(603)37. May 58, 51p. 1 ref. TR AE 5811; AFOSR TN-59-14; AD-208 595.
Order from LC mi$3.60, ph$9.30 PB 140 152

his report summarizes an experimental investigation a new energy transfer mode set forth by Foa; more recisely, an exploratory study of radial-flow air-to-ir induction by pseudo-blades in free-rotor models. est results showing the effects of various gasdynamic nd geometrical parameters are presented. Results limited flow visualization studies are also iscussed.

Rosemount Aeronautical Labs., U. of Minnesota, Minneapolis.
N INVESTIGATION OF THE EFFECT OF RANDOM USELAGE WALL IRREGULARITIES ON FLUSH TATIC PRESSURE PORT CALIBRATIONS, by Frank . Werner and Mary J. Teigen. Rept. on Contract F 33(616)3241. Apr 57, 100p. 4 refs. WADC Tech-ical rept. 57-365; AD-130 805.
Order from LC mi$5.40, ph$15.30 PB 140 366

n investigation of the effect of random surface irregu-arities in the vicinity of flush pressure ports on the tatic pressure calibration characteristics of presuma-y identical aircraft is described. A method for nalysis of wall irregularity effects is presented to-ether with useful computation tables. Such irregu-arities were measured onthirteen B-47, eleven B-52, nd eleven F-101 airplanes and the resulting pressure rrors were computed and are summarized with the elp of small sampling theory statistics. The magni-ude of these errors is significant. Other factors im-ortant to static pressure reproducibility for nose oom, pitot-static tube, and flush port installations ill be dealt with in a future report.

Technical Development Center, Federal Aviation Agency, Indianapolis, Ind.
DETERMINATION OF MEANS TO SAFEGUARD ROTARY-WING AIRCRAFT FROM POWERPLANT FIRES IN FLIGHT. PART 1. FIRE-DETECTION AND FIRE-RESISTANCE STUDIES OF A SIKORSKY H-5A HELICOPTER, by Glenn S. Laudig. Rept. on DA Proj. 9-38-01-000, Subtask 701. Feb 59, 26p. Technical Development rept. no. 351.
Order from OTS $0.75 PB 151 599

The results of a series of simulated in-flight fire ests to determine means for the adequate fire pro-ection of a Sikorsky H-5A helicopter are presented with the intention of applying some of the results to otary-wing aircraft of present and future design. The tests conducted on the H-5A installation represent he first in a series of simulated in-flight fire studies onducted on rotary-wing aircraft by the FAA Techni-al Development Center.

Technical Development Center, Federal Aviation Agency, Indianapolis, Ind.
DETERMINATION OF THE DAYTIME CONSPICUITY OF A SMALL AIRPLANE IN A TERMINAL AREA, by Philip R. Marshall and R. Byron Fisher. Jan 59, 18p. 4 refs. Technical Development Rept. no. 382.
Order from OTS $0.50 PB 151 600

The average detection distance for a small single-engine aircraft was determined in a terminal area during daytime VFR conditions. Pilots were exposed to actual midair collision situations by having another normally painted and equipped airplane approach on various collision courses. The separation distance between the two aircraft was recorded at the time the subject pilot detected the approaching airplane. Also, the pilot's reactions and performance were recorded as the two aircraft continued to converge. The results of these studies indicate the average performance that might be expected of private pilots flying small single-engine airplanes in a terminal area under normal VFR conditions. The pilots' performance may be improved if better search habits and cockpit procedures are developed by each individual; however, due to the workload in the cockpit, they cannot be expected to detect an aircraft at threshold (the greatest distance that the aircraft can be detected and identified as such with the naked eye). The results also indicate the need for improving aircraft conspicuity and the need for a proximity warning device to help the pilot detect other aircraft visually. There is an indication that pilots are unable to recognize impending collision situations in flight, by the aspect of an approaching aircraft at the time of detection, until the two airplanes have reached dangerous proximity to each other. This may be due to the small area presented by a small private-type airplane. The average separation distance at the time of detection was greater for the straight-in approach and the turn-in approach maneuvers, when both aircraft were flying straight and level prior to the convergence point, than for the departure and climb maneuvers when the two aircraft has some vertical separation. This may indicate that altitude separation at the time of detection adds to an already confusing situation with which pilots are either unfamiliar or incapable of recognizing as dangerous.

Technical Development Center, Federal Aviation Agency, Indianapolis, Ind.
EVALUATION OF FIRE-DETECTION SYSTEMS PROPOSED FOR THE MARTIN YP6M AIRPLANE, by Joseph Osman. Dec 58 [10]p. Technical Development Rept 302.
Order from OTS $0.50 PB 151 577

The proposed continuous detection-system configuration should provide effective detection of nacelle fires, if: (1) an additional element is routed near the forward firewall area and the lower forward portion of the nacelle which contains numerous fluid-system components, and (2) the element in the area of fire positions O, P, and W is repositioned halfway between the engine and structural rib surfaces. The Fireye system configuration tested would provide effective detection of nacelle fires, if two additional sensing units are placed near nacelle station 268.25 at the 10 o'clock and 1 o'clock positions, and directed aft.

Technical Development Center, Federal Aviation Agency, Indianapolis, Ind.
SIMULATION TESTS OF A TACTICAL AIRWAY SYSTEM, by Clair M. Anderson and Tirey K. Vickers. Jan 59 [29]p. 3 refs. Technical Development Rept. no. 279.
Order from OTS $0.75 PB 151 579

This report describes the testing of a number of route

configurations and air traffic control procedures developed for an experimental tactical airway system which is to be established by the Department of the Army in the vicinity of Fort Huachuca, Ariz. The tests were conducted on the dynamic air traffic control simulator at the FAA Technical Development Center at Indianapolis. By-products of this program included the development of new procedures and displays for the control of high-density airway traffic. These developments are expected to have future application in the common military/civil air navigation and traffic control system.

Technical Development Center, Federal Aviation Agency, Indianapolis, Ind.
A STUDY OF THE HELICOPTER CRASH-FIRE PROBLEM, by Daniel E. Sommers. Feb 59 [22]p. 11 refs. Technical Development Rept. no. 354.
Order from OTS $0.75 PB 151 578

Helicopter crash accidents resulting in fire have become a serious hazard often destroying the aircraft and causing permanent or fatal injuries to occupants who normally would have survived the impact. Present helicopter design features were analyzed from a crash-fire safety standpoint. The physical relocation of some components in helicopter aircraft could greatly reduce the probability of fire occurring in the event of a crash. Published literature concerning fixed- and rotary-wing aircraft accidents and crash-fire research investigations was reviewed and analyzed. The need for developing design criteria and determining requirements for helicopter crash-fire protection was clearly indicated.

Wichita U., Kans.
EVALUATION OF THE PERFORMANCE, STABILITY AND CONTROL OF THE HELIO COURIER AIRPLANE, by A. J. Craig. Final rept. on Contract DA 44-177-tc-369. Feb 57, 143p. 3 refs. Engineering rept. no. 264; AD-140 223.
Order from LC mi$7.20, ph$22.80 PB 136 113

The object of the tests was to evaluate the performance, stability and control of the Helio Courier Model 391B with particular emphasis on the capabilities of the aircraft in the role of a STOL vehicle. Conventional methods were used in flight testing in accordance with the procedures outlined in AGARD Flight Test Manuals, Volumes I and II, where applicable, plus extensive use of a Fairchild Flight Analyzer for take-off and landing maneuvers. It was not within the scope of this program to provide recommendations with regard to the subject airplane, but rather to objectively determine the characteristics of the Courier.

Wichita U. School of Engineering, Kans.
RANGE OF APPLICATION OF SHROUDED PROPELLERS, by H. E. Helmbold. Aug 55, declassified 29 Feb 56. 15p. 2 refs. Engineering study no. 189; AD-98 012.
Order from LC mi$2.40, ph$3.30 PB 140 322

The propeller shroud is known as a device to increase thrust and efficiency of restricted-diameter propellers at static and low-speed states of operation. It also has been suggested that the shroud could be useful to keep the internal advance ratio automatically constant, thus making variable pitch unnecessary. Finally it could be asked if by using a shroud the total thrust of the propeller-shroud combination can be made independent of free stream velocity. The subject of this study is to establish in terms of aerodynamic properties of the shroud the requirements resulting from these different tasks and to explore the possibility of producing the required aerodynamic properties.

Chemical Engineering

Army Chemical Warfare Labs., Army Chemical Center, Md.
APPARATUS FOR STUDY OF THE BREAKUP OF LIQUID DROPS BY HIGH VELOCITY AIRSTREAMS, by James D. Wilcox and Ronald K. June. May 58, 21p. 10 refs. CWL Special Pub. 1-4.
Order from LC mi$2.70, ph$4.80 PB 138 162

In connection with investigations being conducted on the basic factors involved in the breakup of liquids and the formation of aerosols, the breakup of drops is being studied under conditions that occur in spray from high-speed aircraft and in explosive dissemination. This is the first report of a series on drop breakup studies. In this report the apparatus built for these studies is described. Initially a blast gun was used, and for reasons discussed herein, a shock tube was used in the later phases. Subsequent reports will describe the experimental results in detail.

Atlantic Research Corp., Alexandria, Va.
SURVEY OF FUNDAMENTAL KNOWLEDGE OF MECHANISMS OF ACTION OF FLAME-EXTINGUISHING AGENTS, by Raymond Friedman and Joseph B. Levy. Supplementary rept. on Contract AF 33(616)5569. Sep 58, 22p. 80 refs. WADC Technical rept. 56-568; Suppl. 1; AD-208 317.
Order from OTS $0.75 PB 121 853S

This supplementary report reviews advances in the current state of knowledge of the physico-chemical means by which flames are extinguished for the period May 1956 through May 1958. The report includes a review of current research in relevant background areas. The bibliography contains 80 references, of which the great majority refer to background work rather than direct studies of extinguishing-agent mechanisms.

Institute of Industrial Research, U. of Louisville, Ky.
A BIBLIOGRAPHY OF SELECTED BORIDES, NITRIDES, AND PHOSPHIDES, by T. R. Bailey, Henry James and LeRoy A. Peterson. [Rept. on Contract N8onr-802(00)]. [1949] 15p. 140 refs. AD-46 550.
Order from LC mi$2.40, ph$3.30 PB 128 599

James Forrestal Research Center, Princeton U., N. J.
A MULTIPLE RANGE VISCOMETER FOR LIQUIDS,

by E. F. Johnson, P. E. Parisot, and D. R. MacRae. Technical rept. PR-72-M on Project Squid, Contract N6ori-105(03). Aug 57, 13p. 4 refs.
Order from LC mi$2.40, ph$3.30 PB 135 115

Although viscosity for Newtonian fluids is a relatively easy property to measure and many data are presently available, there are surprisingly few data for Newtonian liquids at temperatures between the normal boiling point and the critical temperature. This article describes a multiple range capillary-type viscometer capable of reliable measurements at temperatures up to 300° C and pressures up to 100 atmospheres, which covers the above temperature range for low molecular weight organic liquids.

Naval Civil Engineering Lab., Port Hueneme, Calif.
ELECTROLYSIS OF SEA WATER, OF SEA WATER FORTIFIED WITH SALT, AND FRESH (TAP) WATER FORTIFIED WITH SALT, by T. Roe, Jr., A. E. Hanna, and H. Hochman. Final rept. 20 Dec 58, 32p. Technical rept. R-012; AD-201 641.
Order from LC mi$3.00, ph$6.30 PB 140 029

This paper presents experimental data which shows the extent to which sodium hypochlorite can be produced for decontamination purposes by the electrolysis of sea water, sea water fortified with salt, and fresh (tap) water fortified with salt. Using multiple pass operation, two parallel plate cells can produce a maximum of 2.03% (20, 300 ppm) available chlorine from sea water saturated with salt, if the initial solution temperature is maintained throughout the operation by the use of heat exchangers between cells. Under the same conditions, a maximum of 1.55% (15, 500 ppm) available chlorine can be produced from fresh (tap) water saturated with salt and a maximum of 0.82% (8, 200 ppm) can be produced from sea water.

Navy Experimental Diving Unit, Naval Gun Factory, Washington, D. C.
ADAPTATION OF HELIUM-OXYGEN TO MIXED-GAS SCUBA, by G. J. Duffner, J. F. Snyder, and L. L. Smith. 27 Jan 59, 41p. 18 refs. Research rept. 3-59.
Order from LC mi$3.30, ph$7.80 PB 140 033

A theoretical no-decompression curve for dives in which an 80% helium - 20% oxygen breathing mixture is employed was postulated from known data. 109 test dives were then performed using depth-time combinations falling along this curve, using 17 enlisted navy divers as subjects. The limiting rate of ascent following dives in which an 80%He-20%02 breathing mixture was employed was also investigated. 78 dives employing decompression stops were also performed.

Office of Scientific Research and Development. Div. 9.
N-NITROSO-N-CHLOROETHYLCARBANIC ACID METHYL ESTER (TL 186) by Max Bergmann (Rockefeller Inst. for Medical Research). Formal progress rept. to 1 Jan 43 on Contract OEMsr-313. 2 Feb 43, declassified 14 Aug 57, 29p. OSRD no. 1172; ATI-30 267.
Order from LC mi$2.70, ph$4.80 PB 140 102

In this report Dr. Stein and Dr. Bergmann examine the course of decomposition of TL 186 is examined in simple aqueous solution, in solution buffered at pH 8 with $NaHCO_3$, with phosphate at pH 6.6, and with acetate at pH 3.8; and study the reactions of the compound with primary and secondary amino groups and sulfhydryl groups.

Office of Scientific Research and Development. Div. 9.
N-NITROSO-N-CHLOROETHYLCARBANIC ACID METHYL ESTER (TL 186) by Irving Graef, David Karnofsky and Homer W. Smith (New York U. Coll. of Medicine). Progress rept. to 1 Mar 43 on Contract OEMsr-556. 17 Mar 43, declassified 14 Aug 57, 32p. 1 ref. OSRD no. 1272; ATI-30 229.
Order from LC mi$3.00, ph$6.30 PB 140 101

The high toxicity of TL 186 by inhalation was confirmed. Data on the LC_{50} for both mice and rats for a 10 minute exposure was 0.035 mg/1., but it lacked gross pharmacological action when administered intravenously in many multiples of the intravenous LC_{50}. In animals gassed at LC_{50} the internal pathological lesions were confined to the upper respiratory tract indicating rapid reaction and absorption before the alveolic was reached. When administered by routes other than inhalation the action of the compound was confined to a fairly severe local necrotizing action with occasional thrombosis. The cutaneous, subcutaneous, and intravenous toxicity was low relative to the LC_{50} by inhalation. It was also very slowly absorbed through the skin.

Office of Scientific Research and Development. [Div. 9].
THE PREPARATION AND PROPERTIES OF ALKYL-N-NITROSO-N-ALKYLCARBONATES AND RELATED COMPOUNDS, by M. S. Kharasch (Toxicity Lab., U. of Chicago). Rept. to 25 Nov 42 on Contract OEMsr-394. 9 Dec 42, declassified 14 Aug 57, 29p. OSRD no. 1117; ATI-30 203.
Order from LC mi$2.70, ph$4.80 PB 140 103

The following report contains descriptions of the laboratory methods used to prepare nitroso-carbamates and related substances regarded as possible toxic agents. Detailed descriptions of the properties of some of the more important compounds are also included.

Westinghouse Research Labs., Pittsburgh, Pa.
ELECTRICAL CLEANUP OF GASES, by J. H. CARMICHAEL and J. S. Knoll. Rept. for Jan - Mar 58 on Contract AF 18(600)1049. 5 June 58, 4p. Research rept. 71F191-R16.
Order from LC mi$1.80, ph$1.80 PB 135 608

The studies of the ionic pumping of four noble gases, helium, neon, argon, and krypton, into molybdenum and nickel have reached the state of near completion. A preliminary study of the ionic pumping of active gases such as hydrogen and nitrogen has been made in order to determine the feasibility of studying the ionic pumping of active gases with the same techniques used in the noble gas studies.

Office of Scientific Research and Development. Div. 9.
PULMONARY INSUFFICIENCY IN RABBITS RECEIVING N-NITROSO-N-CHLORETHYL CARBANIC ACID METHYL ESTER (TL-186) INTRAVENOUSLY, by Betty Crawford and Homer W. Smith (New York U. Coll. of Medicine). Progress rept. to 1 Mar 43 on Contract OEMsr-556. 23 Mar 43, declassified 14 Aug 57, 13p. 1 ref. OSRD no. 1286; ATI-30 228.
Order from LC mi$2.40, ph$3.30 PB 140 100

Arterial and venous O_2 and CO_2 content, O_2 capacity and hemoglobin content have been determined in left and right heart blood in rabbits intoxicated by the intravenous administration of TL 186. Observations spaced at approximately 24 hours intervals. From data pulmonary odema appears to develop slowly, and once developed to culminate quickly in death.

Civil Engineering

[Army Engineer] Waterways Experiment Station, Vicksburg, Miss.
INFLUENCE OF CHEMICALS AND MINERAL FINES ON PUMPABILITY, by T. B. Kennedy and J. M. Polatty. Rept. no. 1 on Tests of Sanded Grouts. Oct 55, 28p. Technical memo. no. 6-419.
Order from LC mi$2.70, ph$4.80 PB 140 188

This report provides information on the amount of natural sand sieved to pass a No. 16 sieve that could be used to adulterate portland-cement grout without injuring its pumpability. Two parts of sand to one of cement could be used without admixtures. Certain admixtures permitted grouts with much greater sand-cement ratios to be pumped. Temperature and length of mixing and pumping time appeared to influence the sand-carrying capacity of the grouts.

Army Engineer Waterways Experiment Station, Vicksburg, Miss.
INFLUENCE OF GRADING AND SPECIFIC GRAVITY OF MANUFACTURED SANDS ON PUMPABILITY, by James M. Polatty. Rept. no. 3 on Tests of Sanded Grouts. Feb 57, 17p. 1 ref. Technical memo. no. 6-419.
Order from LC mi$2.40, ph$3.30 PB 140 190

It was found possible to pump 1.75 parts of both limestone and traprock sand to 1.0 part of cement by weight when the sand contained no material finer than the No. 100 sieve size, and 7 parts of limestone sand and 2.25 parts of traprock sand to 1.0 of cement when 25 per cent of either sand was finer than the No. 100 sieve size. The addition of the noncementitious mineral fines (fly ash and loess) had almost the same effect on pumpability as the addition of the same amount of limestone fines. Traprock fines were less efficient in increasing pumpability. (See also PB 140 189)

[Army Engineer] Waterways Experiment Station, Vicksburg, Miss.
INFLUENCE OF SAND GRADING AND ADDITION OF MINERAL FINES ON PUMPABILITY, by James M. Polatty. Rept. no. 2 on Tests of Sanded Grouts. Oct 55, 18p. Technical memo. no. 6-419.
Order from LC mi$2.40, ph$3.30 PB 140 189

The maximum amount of sand that could be pumped in a sand-cement grout was determined, using sands with six different percentages of particles finer than the No. 100 sieve. It was found possible to pump two parts of sand to one of cement when the sand contained no sizes passing the No. 100 sieve, and three parts of sand to one of cement with 25 per cent of the sand passing the No. 100 sieve. The additions of uncalcined diatomite, fly ash, pumicite, and loess increased the quantity of sand that could be pumped. (See also PB 140 188)

Army Engineer Waterways Experiment Station, Vicksburg, Miss.
TESTS OF HOLDING STRENGTH OF FORM ANCHORS EMBEDDED IN CONCRETE PLACED AND CAST AT REDUCED TEMPERATURES, by Ralph A. Bendinelli. Feb 58, 16p. 4 refs. Technical rept. no. 6-473.
Order from LC mi$2.40, ph$3.30 PB 137 426

Adequately designed anchors will provide resistance at 3 days age in excess of normally expected loads even though the concrete has a cement content as low as 2.5 bags per cu yd. Use of fly ash as a replacement material reduced holding power of the anchors appreciably, but not below a safe level.

Bureau of Yards and Docks, Washington, D. C.
GENERAL FORMULAS. Engineered Performance Standards, Public Works Maintenance. Aug 58, 215p
Order from LC mi$9.60, ph$33.30 PB 139 760

Bureau of Yards and Docks, Washington, D. C.
GENERAL HANDBOOK. Engineered Performance Standards, Public Works Maintenance. Aug 58, 107p.
Order from LC mi$5.70, ph$16.80 PB 139 761

Iowa Engineering Experiment Station, Ames.
GEOLOGY AND BITUMINOUS STABILIZATION OF SOIL MATERIALS AT POINT BARROW, ALASKA, by J. B. O'Sullivan, D. T. Davidson and others. Final rept. 3 on Contract Nonr-530(04). 30 June 58, 120p. 56 refs.
Order from LC mi$6.00, ph$18.30 PB 140 118

The stability of the beach materials can be satisfactorily increased by mechanical stabilization. The available crude oil can be used in bituminous stabilization of base and surface courses only after blowing to increase its cohesive properties. The tentative designs given are still subject to economic evaluation and further testing, before sufficient information is available for other than construction of test strips.

National Research Labs., Ottawa (Canada).
THE GREAT LAKES-ST. LAWRENCE DEEP WATERWAY, by E. S. Turner. Aug 58, 32p. Rept. MH-71.
Order from LC mi$3.00, ph$6.30 PB 135 821

This note describes briefly the canals which have been constructed to improve navigation between the Great Lakes and the sea. Particular reference is made to the St. Lawrence Seaway project which is scheduled to be opened, in part, for 14-foot navigation in July 1958 and for completion in 1959. Only a brief description of the main features is given, there being no reference to construction procedures or description of the rehabilitation measures required when communities in the flooded area were moved.

Naval Civil Engineering Lab., Port Hueneme, Calif.
ENGINEERING EVALUATION OF LARGE STEEL PONTOONS AND BOW/STERN PONTOONS, by J. J. Traffalis. Final rept. 16 Feb 59, 30p. 7 refs. Technical rept. R-017; AD-205 591.
Order from LC mi$2.70, ph$4.80 PB 140 057

The large pontoon and the bow/stern pontoon were structurally adequate individually and when assembled into a barge. Due to their size, weight and the heavy duty equipment required for handling, it is recommended that the large pontoons not be accepted for advance base use.

Naval Civil Engineering Lab., Port Hueneme, Calif.
INFLUENCE OF GRADE OF STEEL ON BLAST RESISTANCE OF REINFORCED CONCRETE BEAMS, by W. A. Shaw and J. R. Allgood. Final rept. 1 Jan 59, 25p. 10 refs. Technical rept. R-013; AD-201 109.
Order from LC mi$2.70, ph$4.80 PB 140 058

Based upon preselected criteria of failure, the peak dynamic load carrying capacity is calculated for beams of a given configuration but having different percentages and grades of reinforcing steel. It is shown that the suitability of various grades of reinforcing steel will depend primarily upon the maximum permissible deflection, the characteristics of the loading, and the amount of tension steel used.

Polytechnic Inst. of Brooklyn, N. Y.
A THEORETICAL AND EXPERIMENTAL INVESTIGATION OF CREEP BUCKLING, by J. C. Chapman, Burton Erickson, and N. J. Hoff. Rept. on Contract Nonr-839(18). Oct 57, 45p. 4 refs. PIBAL rept. no. 406.
Order from LC mi$3.30, ph$7.80 PB 136 670

A procedure for the determination of the collapse time of pin-ended aluminum alloy columns subject to creep. The analysis is carried out on the assumption that the actual column can be replaced by an idealized two-flange column which deflects sinusoidally up to failure. The flexural stiffness is taken as constant along the length of the column and equal to the mid-point stiffness, which is determined from the stress-strain curve of the material. The corresponding "critical time" is then calculated by using the creep-strain v. time curves of the material.

Princeton U., N. J.
APPLIED SOIL MECHANICS, by Gregory P. Tschebotarioff. Final rept. on Contract Nonr-1009(00). 30 Aug 57, 7p.
Order from LC mi$1.80, ph$1.80 PB 136 469

Part I: Fundamental study of passive earth pressure
Part II: Tensile strength of soils
Part III: Performance of full-scale field control measurements
Part IV: Triaxial "cell" tests on clay soils

Electrical and Electronic Engineering

Aerial Reconnaisance Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
BIBLIOGRAPHY ON THE EFFECTS OF RADIATION, by Elizabeth Hollaway. Nov 56, 11p. 63 refs. WADC Technical note 56-474; AD-110 516.
Order from LC mi$2.40, ph$3.30 PB 140 168

Aero Medical Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
A MULTI-FIELD ELECTRONIC TACHISTOSCOPE, by Paul A. Kolers. Rept. on Fundamental Parameters in Perception. Dec 58, 11p. WADC Technical note 58-349; AD-208 320.
Order from OTS $0.50 PB 151 689

A multi-field electronic tachistoscope is described which has variable duration, sequence, and intensity controls. In addition, the device may be cycled automatically, or be made to run through a single cycle manually. Each viewing field can be illuminated for durations ranging from 1 msec. to 3 sec. during automatic operation. The upper limit of the exposure duration may be increased to any desired value greater than 3 sec. by means of a manually operated switch. Other provisions are described which control intensity of the illuminated or transilluminated stimulus materials.

Aeronautical Electronic and Electrical Lab., Naval Air Development Center, Johnsville, Pa.
GRAPHS OF TRANSMISSION AND PHASE DATA OF PLANE DIELECTRIC SHEETS FOR RADOME DESIGN, by J. A. di Toro. 1 July 53, 131p. Rept. no. NADC-EL-5313.
Order from LC mi$6.90, ph$21.30 PB 140 094

The graphs given in this report plot power transmission coefficient, phase delay, and reflection phase shift, for perpendicular and parallel polarizations versus thickness to free space wavelength ratio with angle of incidence as parameter and for dielectric constants 1.2, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, and 6.0. The curves are plotted only for the lossless case and points are used to show lossy cases.

Aeronautical Electronic and Electrical Lab., Naval Air Development Center, Johnsville, Pa.
IMPEDANCE MEASUREMENT OF STABILIZATION NETWORK AN/USA-2, by C. S. Vasaka. Technical note, 12 May 55, 7p. Rept. no. NADC-EL-N5540.
Order from LC mi$1.80, ph$1.80 PB 140 323

The test method described is satisfactory for use as a practical way of determining whether the impedance of Stabilization Network AN/USA-2 meets the requirements. Within the limitations discussed, the described test method can be used in many applications in lieu of the standard method requiring the use of an impedance bridge.

Air Force Cambridge Research Center, Bedford, Mass.
THE AN/UPA-35 INDICATOR AS A CARTRAC AND MIO DISPLAY, by Albert H. Lorentzen and Martley F. Mellow. July 58, 14p. 5 refs. AFCRC-TR-58-167; AD-152 458.
Order from LC mi$2.40, ph$3.30 PB 140 162

With a few modifications, none major, the AN/UPA-35 indicator can be adapted to function as the display for either the CARTRAC or the MIO consoles of the AN/TSQ-13 Aircraft Direction and Reporting System. Proper display of the assignment spot requires additional electronic switching; optimum performance in display and tracking functions requires a common sawtooth. The unqualified use of the AN/UPA-35 as a tracking display is limited by the 17.5-kcps bandwidth of the sweep amplifiers since a bandwidth of 250 kcps is needed for accurate rate-aided tracking.

Air Force Cambridge Research Center, Bedford, Mass.
LIMITED CLIPPED INTEGRATION, by John P. Castelli. July 58, 20p. AFCRC-TR-58-166; AD-152 457.
Order from LC mi$2.40, ph$3.30 PB 140 163

Limited Clipped Integration (LCI) is a method for improving radar video presentation. It effectively eliminates noise and interference from the video output, working ideally on signals from which ground clutter has been removed. With a feedback gain of one and a memory of three it is especially valuable for use with automatic computers. In an area where jamming is most severe, its reliability has been proven by three years of operation. Economical and practical, its addition to existing radars is a simple matter.

Air Force Cambridge Research Center, Bedford, Mass.
A NEW METHOD FOR OBTAINING MAXIMUM GAIN FROM YAGI ANTENNAS, by H. W. Ehrenspeck and H. Poehler. Dec 58, 24p. 12 refs. AFCRC-TR-58-355; AD-160 761.
Order from LC mi$2.70, ph$4.80 PB 140 142

In conventional Yagi design, optimum performance requires separate adjustments in a number of parameters — the array length and the height, diameter, and spacing of the directors and reflector. By introducing the notion of a surface wave traveling along the array, it is possible to demonstrate the interrelationship between these parameters experimentally. The gain then depends only on the phase velocity of the surface wave (which is a function of the height, diameter, and spacing of the directors) and on the choice of the reflector. Maximum gain for a given array length, for any director spacing less than 0.5λ, can be obtained by suitable variation of the parameters to yield the desired phase velocity. A design procedure that provides maximum gain for a given array length is presented.

Air Force Cambridge Research Center, Bedford, Mass.
SANDWICH-WIRE ANTENNA DESIGN, by Walter Rotman and Nicholas Karas. Dec 58, 34p. 8 refs. AFCRC-TR-59-103; AD-160 764.
Order from LC mi$3.00, ph$6.30 PB 140 157

A new microwave line source configuration consists basically of three continuous coplanar conductors. The two outer conductors, parallel to each other, are at ground potential; the excited center conductor is bent into sinusoidal form, with a period (for broadside radiation) equal to the wavelength. The polarization is transverse to the length of the array. Modifications of the basic design include a printed-circuit (metal on dielectric) two-dimensional array fed by a corporate structure feed. Design data, including attenuation and phase characteristics, are given for a flat-plate S-band model. An array to fit a cylindrical surface is discussed. These structures are mechanically simple, have good impedance characteristics, and allow good control over aperature illumination.

Air Force Cambridge Research Center, Bedford, Mass.
STUDY OF X-BAND PROPAGATION BEYOND LINE OF SIGHT, by Joseph W. Page and Herbert E. Whitney. July 58, 31p. 17 refs. AFCRC-TR-58-164; AD-152 455.
Order from LC mi$3.00, ph$6.30 PB 140 164

X-band tropospheric scatter measurements were made to determine the feasibility of a proposed 100-mile X-band link. The data and results are given for signal strength measurements up to 77 miles. Short-time amplitude distributions were determined. The operational capability and reliability of the 100-mile link is discussed, based on the results of the measurements. It was concluded that the increased gain necessary to meet the reliability requirements for the proposed X-band link would be prohibitive at the present time.

Air Force Cambridge Research Center, Bedford, Mass.
TROUGH WAVEGUIDE RADIATORS WITH PERIODIC POSTS, by Walter Rotman and Nicholas Karas. Dec 58, 32p. 10 refs. AFCRC-TR-58-356; AD-160 762.
Order from LC mi$3.00, ph$6.30 PB 140 158

In a trough waveguide loaded by equispaced posts on its center fin the phase velocity of the dominant mode can have a phase velocity greater or less than that in freespace. The radiation from this periodic structure can be controlled by lowering the sidewall of the trough waveguide until the tops of the posts protrude above it. At any phase velocity close to that of freespace, radiation patterns are endfire, with polarization parallel to the center fin. Under conditions of large post spacing, the phase velocity in the post-loaded trough waveguide can be predicted to a good approximation on the basis of the analysis presented. Measurements show that the phase velocity is

ssentially independent of the height of the sidewalls nd that the attenuation constant (not evaluated in the heory) is a function of both the wall height and the umber of posts per unit length of guide. Measured atterns of a post-loaded trough waveguide show the xpected endfire characteristics over a wide frequency ange. The combination of two trough waveguide adiators and a stripline hybrid junction produces a onopulse antenna with endfire sum and difference atterns.

Air Force Missile Test Center, Patrick AFB, Fla.
TESTS OF THE VHF/SECOR, by Harry W. Trigg. Rept. on Phase 1. 2 Sep 57, 12p. AFMTC TN-57-23; AD-124 143.
Order from LC mi$2.40, ph$3.30 PB 135 690

The report describes the various flights and methods used for adjusting and checking out both the individual DME's (Distance Measuring Equipment) and the SECOR sequencing method. The purposes and accomplishments of the first nine flights are discussed. Flight Number 1140, the 10th of this series, was the only one conducted without adjustments being made to the ground equipment during test and is, therefore, the only one whose data can be considered representative of the DME's capability. A typical sample of data from this test is shown. Eleven such groups were obtained and analyzed for noise by the Variate Difference Method. The one sigma dispersion of noise for these data groups varied between three and six feet. The maximum tracking range against a target flying at an altitude of 18,000 feet was approximately 115 nautical miles.

American Phenolic Corp., Chicago, Ill.
CABLE, RADIO FREQUENCY: STUDY OF POWER RATINGS, by G. J. Mares. Rept. on Contract AF 33(038)20145. Nov 55, 75p. 42 refs. AFTR-1498-028; AD-84 333.
Order from LC mi$4.50, ph$12.30 PB 139 924

An analysis is made of various methods of measuring power input to coaxial cables and a substitution calorimetric method was selected as the most suitable for determining the power rating of coaxial cables. Experimental power rating data is presented for selected polyethylene and particularly for Teflon coaxial cables. Curves of power handling capacity versus frequency over the range of 100 mcs to 10,000 mcs are given at standard conditions of ambient temperature of 104° F (40° C), sea level and unity standing wave ratio. These power ratings were established at a center conductor temperature of 175° F (79.44° C) for polyethylene cables and 482° F (250° C) for Teflon cables. This power rating data for standard conditions is further extended through charts and formulae to conditions of ambient temperature from -85° F (-65° C) to 175° F (79.44° C) for polyethylene and 482° F (250° C) for Teflon, to conditions of altitude from sea level to 70,000 feet, and to conditions of VSWR from 1.0:1.0 to 2.0:1.0.

Antenna Lab., Ohio State U., Research Foundation, Columbus.
EFFECTS OF RADOME DISCONTINUITIES ON ANTENNA PATTERNS. Interim engineering rept. for 1 May-31 July 57 on Contract AF 30(602)1620. 31 Aug 57, 46p. 11 refs. RADC TN-57-337; AD-131 294.
Order from LC mi$3.30, ph$7.80 PB 136 557

Several studies were made on specific rib configurations. From this work it was seen that: (1) a dielectric rib may scatter as much as or more energy than a conducting rib of the same size; (2) metal ribs may exhibit very little scattering when the electric field is perpendicular to the axis of the rib; (3) when a radome framework is composed of conducting elements about five wavelengths or more in length, there is no appreciable difference in the scattered fields whether the ribs are insulated or connected to each other at their ends; (4) the effects of small metal objects with size and arrangement typical of the bolts of a reinforced, plastic, geodesic radome are negligible.

Army [Rocket and Guided] Missile Agency, Redstone, Ala.
ANALYSIS OF CARRIER SYSTEMS BY MODULATION-EQUIVALENT TRANSFER MATRICES, by Hans H. Hosenthien. 1 Mar 56, 58p. 11 refs. Rept. no. 1R10.
Order from LC mi$3.60, ph$9.30 PB 137 668

In this report, a modulation-equivalent method of analysis is presented which applies to carrier systems employing suppressed-carrier amplitude modulation, such as a-c analog computers, a-c control systems, and a-c servo systems. The method presented is based on the Laplacian transfer function of the system and its components. By means of the theorem of complex translation, the modulation-equivalent 2 by 2 transfer matrix of a transfer function is derived. The system can then be directly analyzed with respect to the Laplace transforms of the modulating signals by means of matrix algebra. Rules and examples for the manipulation of the modulation-equivalent transfer matrices are given.

Army Signal Engineering Labs., Fort Monmouth, N. J.
A SIMPLE TRANSISTOR TEST SET, by Harry V. Wood, 1 Aug 57 [9]p. Technical memo. M-1909; AD-141 749.
Order from OTS $0.50 PB 151 300

A small versatile transistor test set was designed to measure collector cutoff current (ICO), emitter cutoff current (IEO), and the dc large-signal common-emitter current gain (HFE). A wafer polarity switch is included to accomodate both p-n-p and n-p-n transistors. ICO and IEO are measured at 2.68 v which is supplied by 2 mercury cells, the only power source of the instrument. In measuring HFE, the 2.68 v is included in the collector-to-emitter circuit as the collector supply voltages. A 134 K resistor, in series with the 2.68 v, supplies a 20-μamp constant base current. A 20-μamp meter is used in measuring ICO and IEO. A shunt resistor, used when HFE is being measured, converts 20μa to 2 ma.

Army [Signal Missile Support] Agency, White Sands Missile Range, N. Mex.
LABORATORY INVESTIGATION OF RALPH M. PARSONS MODEL 7501 and 7501-A FM TELEMETERING TRANSMITTERS, by Elbert E. Ginn, Jr. Jan 58 61p. AFC rept. no. TM-27-1-58-T.
Order from LC mi$3.90, ph$10.80 PB 135 610

Spurious Emissions, 5.0 MCS removed from the fundamental, were observed at less than 30 db down. Frequency stability was better than 0.02%.

Army [Signal Missile Support] Agency, White Sands Missile Range, N. Mex.
LABORATORY INVESTIGATION OF RECEIVER, SUMMERS GYROSCOPE COMPANY MODEL 142J, by M. A. Olson. Apr 58, 48p. AFC rept. no. DC 30-4-58 RdeC.
Order from LC mi$3.30, ph$7.80 PB 135 859

Results are presented on a laboratory investigation of the Summers Gyroscope Model 142J Receiver. Sensitivity and frequency stability were measured against parameters of supply voltage variation, operating time, simulated altitude and vibration. Tests were also conducted on selectivity, spurious responses, spurious emissions, audio selectivity, spurious audio responses, audio distortion, antenna input VSWR, interference characteristics and antenna characteristics.

Ateliers de Constructions Electriques de Charleroi (Belgium).
INVESTIGATION OF THE DISCHARGE IN A FLUORESCENT TUBE BY MEANS OF A STROBOSCOPE, by Max Hoyaux and Paul Gans. Rept. on Contract AF 61(514)630-C. [1955] 14p. 3 refs. EOARDC TN-55-6; AFOSR TN-57-275; AD-126 577.
Order from LC mi$2.40, ph$3.30 PB 134 909

A stroboscopic method has been employed to study the propagation of luminous fronts in fluorescent tubes both on striking and at extinction. Measurements have been carried out on tubes with walls of "conducting" glass and of normal glass. There was no difference in the results with the limits of experimental error. On striking the tube, it was found that the luminous front, if it exists, is propagated with a velocity much greater than the maximum detectable by this method. This maximum velocity is of the order of 50 km/sec. On extinction, luminous fronts leave the anode and cathode simultaneously with velocities of the order of 3 km/sec. They accelerate as they move towards the center and their velocities become unmeasurable. The dependence of the velocity on the wall temperature was investigated. The velocity was found to increase with increasing wall temperature. A theoretical interpretation of the behavior of the "extinction" fronts is suggested based on the decay of the residual ionization in the reverse half cycle.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
INVESTIGATION OF EXPENDABLE FLASH X-RAY TUBES, by George E. Hauver. Jan 54, 15p. 4 refs. Memo. rept. no. 754.
Order from LC mi$2.40, ph$3.30 PB 139 932

Details of the designs, tests and performance evaluations of several types of experimental expendable flash X-ray tubes are described. Tube performance is evaluated by the quantity of X-rays emitted, focal spot size and flash characteristics. Flash characteristics are determined from radiographs of shaped charge jets from DuPont Jet Perforators.

Battelle Memorial Inst., Columbus, Ohio.
COMPONENT EVALUATION AND SPECIFICATION ENGINEERING: TASK XI. TEMPERATURE ELEMENTS, THERMISTORS, by W. E. Chapin and P. G. Perry. Final rept. on Contract DA-36-039-sc-63136. 15 June 54, 283p.
Order from LC mi$11.10, ph$44.10 PB 139 990

This assignment was confined to an investigation of the electrical performance of rod, disk, and bead thermistors as affected by low-temperature storage, moisture resistance, temperature cycling, shelf life, and continuous-load life. The program also included an investigation of temperature hysteresis and steady-state current-time characteristics, of galvanic action, of terminal and body strength, and of the effects of soldering to the terminals. Temperature elements were measured for initial resistance at 0 C, 25 C, and 50 C, in order to establish a basis for comparing subsequent changes due to various investigations included in the program. These initial-resistance measurements were used to calculate material constants (β), which would reflect the changes that occurred during the scheduled investigations of temperature cycling, moisture-resistance cycling, shelf life, load life, and cold-storage exposures. In addition to the above investigations, the temperature hysteresis and steady-state current-time characteristics were developed and the galvanic effects of moisture exposure determined. The physical properties explored were the terminal and body strengths and the effects of vibration, soldering, and terminal twist.

Battelle Memorial Institute, Columbus, Ohio.
SPECIAL MEASUREMENT TECHNIQUES FOR THERMOELECTRIC MATERIALS WITH RESULTS FOR Bi_2Te_3 AND ALLOYS WITH Bi_2Se_3, by T. C. Harman and M. J. Logan. Technical rept. no. 1 on Contract Nonr-2316(00). 1 June 58 [19]p. 6 refs.
Order from OTS $0.50 PB 151 656

A new technique for accurate measurement of the thermoelectric power and thermal conductivity. Involves use of the Peltier heat to maintain a temperature gradient across the specimen. The measurement of this gradient, the voltage across the specimen, and the a-c resistivity allows the calculation of the absolute value of the thermoelectric power and the thermal conductivity.

Brown U. Div. of Engineering, Providence, R. I.
DIELECTRIC SLAB ANTENNAS, by C. M. Angulo, E. T. Kornhauser and others. Technical rept. 11 (Final) for 15 Mar 55-15 Sep 58 on Contract AF 19(604)1391. Oct 58, 33p. 1 ref. AFCRC TR-58-186; AD-152 416.
Order from LC mi$3.00, ph$6.30 PB 140 161

he general purpose of the research was to study wave ropagation in inhomogeneous media and more partic- larly the excitation propagation, and radiation of rface waves from dielectric structures.

Bureau of Yards and Docks, Washington, D. C.
LECTRICAL AND ELECTRONIC BASIC
UPPORTING DATA. Engineered Performance
tandards, Public Works Maintenance. July 57, 417p.
rder from LC mi$11.10, ph$63.60 PB 139 766

Bureau of Yards and Docks, Washington, D. C.
LECTRICAL AND ELECTRONIC HANDBOOK.
ngineered Performance Standards, Public Works
aintenance. July 57, 95p.
rder from LC mi$5.40, ph$15.30 PB 139 765

Bureau of Yards and Docks, Washington, D. C.
LECTRICAL AND ELECTRONIC PRIMARY
UPPORTING DATA. Engineered Performance
tandards, Public Works Maintenance. July 57, 239p.
rder from LC mi$10.20, ph$36.30 PB 139 764

Case Inst. of Tech., Cleveland, Ohio.
TUDY OF CONTROL OF APERTURE FIELDS, by
arlyle J. Sletten. Scientific rept. no. 1 (Semi-annual)
or 1 June-30 Nov 58 on Contract AF 19(604)3887. 1958,
01p. 37 refs. AFCRC-TN-59-124; AD-210 083.
Order from LC mi$5.70, ph$16.80 PB 139 897

Progress is reported on diffraction studies of an infinite strip and slit under oblique incidence due to an incident wave with E parallel and normal to the edges. An evaluation of several approximate techniques is considered. The exact solution in the plane of, and at the center of a slit of varying width S, where $0 < S < 2.2\ \lambda$, is given. Solid angle synthesis of an arbitary pattern is considered by means of a two dimensional plane source. The problem is outlined, and a technique due to Woodward is described. A study to determine the possibility of aperture field control using ferrites in or near the aperture is outlined. The detailed solution for a plane wave falling on an infinite ferrite rod magnetized along the axis is given. A preliminary investigation of anisotropic properties of a conducting strip artificial dielectric medium is given.

Collins Radio Co., Cedar Rapids, Iowa.
SINGLE-SIDEBAND COMMUNICATIONS SYSTEM.
Quarterly interim development rept. no. 9, 15 Oct 57-
15 Jan 58, on Contract AF 30(635)4504. 99p.
IDR-395-29; RADC-TN-58-133; AD-148 731.
Order from LC mi$5.40, ph$15.30 PB 135 701

A total of eleven complete ARC-58 systems have been delivered, nine of which are in operational use in aircraft. Although there have been some difficulties with these systems, when considering the newness of both the mechanical and electrical aspects of the radio, it may be concluded that operation has been very satisfactory. The advantages of modular construction also are being realized in this respect. As revisions in certain modules are made to improve the reliability or operation of the system, those radios which have been delivered may be brought up to date simply by plugging in the revised module. A large portion of this report has been devoted to the activities of the Reliability Program. Most of the changes brought about by these studies have no immediate effect, but it is believed that the increase in reliability of the modules will be demonstrated in the extremely long life of the components. In every case, the greatest margin of safety has been the determining factor in the selection of components for a specific application.

Columbia Radiation Lab., New York.
RESEARCH INVESTIGATION DIRECTED TOWARD EXTENDING THE USEFUL RANGE OF THE ELECTROMAGNETIC SPECTRUM, by P. Kusch.
Quarterly progress rept. no. 5, 16 Dec 56-15 Mar 57, on Contract DA 36-039-sc-64630. 15 Mar 57, 27p.
CU-7-57-sc-64630-Physics.
Order from LC mi$2.70, ph$4.80 PB 136 112

Contents:
The generation of high frequencies
Microwave apparatus and techniques
Tube fabrication techniques
Microwave physics

Computation Lab., Harvard U., Cambridge, Mass.
THEORY OF SWITCHING. Rept. to Bell Telephone Labs. 15 Feb 58, 132p. 43 refs. Rept. no. BL-19.
Order from LC mi$6.90, ph$21.30 PB 136 335

Contents:
Section 1. A class of simultaneous Boolean equations, by Ralph Schwartz
Section 2. Non-disjunctive decompositions, by Allen Curtis
Section 3. A Markov model for sequential processes, by Peter Neumann
App. 1. Functional properties of sequential processes
App. 2. Decoding for a class of segmentable codes

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
FLIGHT EVALUATIONS OF VARIABLE SHORT PERIOD AND PHUGOID CHARACTERISTICS IN A B-26, by Fred Newell and Graham Campbell. Rept. on Flight Control Technical Requirements, Contract AF 33(038)20659. Dec 54, 71p. 4 refs. WADC Technical rept. no. 54-594; AD-92 495.
Order from LC mi$4.50, ph$12.30 PB 140 360

A B-26B airplane elevator control system was modified and small auxiliary pitching surfaces installed so that wide ranges of stability and control characteristics could be simulated. The equipment is described briefly. Qualitative ratings by one pilot were obtained for a range of short period frequencies and damping ratios. These evaluations were done in simulated gunnery runs and by performing fairly rapid maneuvers. Areas of varying degrees of pilot preference are obtained. A range of phugoid damping ratios were evaluated under simulated blind flying conditions by one pilot. A consistent correlation is obtained between phugoid damping and pilot ratings, (the pilot preferring increased damping) and between phugoid

damping and measured altitude variations. However, insufficient data was obtained to permit recommendation of quantitative boundaries of the pilot's preference.

Cornell U. Graduate School of Aeronautical Engineering, Ithaca, N. Y.
THE EFFECT OF ENTRAINMENT UPON A JET-FLAPPED AIRFOIL, by Howard S. London. Rept. on Contract AF 18(600)1523. Dec 57, 52p. 5 refs. AFOSR-TN-57-761; AD-136 750.
Order from LC mi$3.60, ph$9.30 PB 140 364

The effect of entrainment upon the forces on a jet-flapped airfoil is studied. A model is established for a straight two-dimensional incompressible turbulent jet issuing into a free stream and the entrained mass flow calculated. The jet is then replaced by a distribution of sinks which gives the same entrainment. With this sink distribution the potential flow over a thin bi-parabolic airfoil at zero angle of attack, with the jet at zero deflection angle, is calculated, and from this the pressure drag due to entrainment is determined. It is found that although this drag increases with increasing jet thrust, the ratio of entrainment drag to thrust decreases and is of the order of 0.2-0.3 times the thickness ratio of the airfoil. It is further shown that with the jet deflected, the entrainment also induces a negative increment in circulation lift. A method for estimating this increment is outlined.

David Sarnoff Research Center, Princeton, N. J.
BI-PERIODIC MAGNETRON TRAVELING WAVE TUBE STUDY, by J. Berghammer and F. Paschke. Quarterly scientific rept. no. 2, 1 June - 31 Aug 57, on Contract AF 19(604)1937. 1 Sep 57, 19p. AFCRC-TN-57-797; AD-133 754.
Order from LC mi$2.40, ph$3.30 PB 135 519

A transition between a coaxial line and a bi-periodic structure has been designed. Also considerable work has been done on an electron gun to achieve spiral motion of electrons in a hollow beam. Several possibilities have been investigated. In the most promising device, the "spiral lens", potential energy is converted into rotational kinetic energy whereas the axial kinetic energy is not influenced by the lens. An experimental tube for the investigation of crossed-field flow and which employs a spiral lens, has been built and is about ready to be tested.

David Taylor Model Basin, Washington, D. C.
STRENGTH TESTS OF ACOUSTIC WINDOWS IN DOPPLER SONAR DOME ON USS COMPASS ISLAND (EAG 153) by Louis A. Becker. Oct 58, 23p. 5 refs. Rept. 1256.
Order from LC mi$2.70, ph$4.80 PB 139 941

Strains were measured in the steel members used to stiffen the acoustic windows in the sonar dome of USS COMPASS ISLAND (EAG 153) to determine the cause of failures in service. As a result of the tests a modification of the existing design was proposed to the Bureau of Ships. This design was accepted and is now in service.

Electrical Engineering Research Lab., U. of Illinois, Urbana.
STUDY OF SUITABLE TUBE TYPES AND CIRCUITS FOR OSCILLATOR INJECTION TYPE GAIN CONTROL, by Spencer Edward Leifheit. Technical rept. no. 5 on Contract Nonr-1834(02). 25 Jan 57, 155p. 20 refs.
Order from LC mi$7.50, ph$24.30 PB 135 539

Contents:
Selection of suitable tube types
Determination of the required characteristics for the oscillator and signal grids
Selection of four suitable tube types for investigation
Discussion of the modes of operation
Investigation of grid characteristics of the four selected tube types
Conclusions
Investigation of dynamic range and linearity of the four selected tube types in several circuits
Conventional mixer circuit
Push pull mixers with injection type gain control
Push pull gain doubling mixers with injection type gain control
Summary

Electrical Engineering Research Lab., U. of Illinois, Urbana.
THEORETICAL INVESTIGATION OF OSCILLATOR CIRCUITS, by Norman R. Scott. Progress rept. no. 1 for 15 Mar-15 June 49 on Contract W36-039-sc-38202. 1 Oct 49, 33p.
Order from LC mi$3.00, ph$6.30 pb 139 945

Principles of non-linear mechanics are applied to oscillatory systems of one and two degrees of freedom to determine a physical basis for their operation. The method of equivalent linearization is described briefly and is applied to these systems. Starting from simple relations between power supplied by the non-linear element and power dissipated in the linear portion of the system, criteria for stability of oscillation are developed in general terms.

Electrical Engineering Research Lab., U. of Illinois, Urbana.
THEORETICAL INVESTIGATION OF OSCILLATOR CIRCUITS, by Norman R. Scott. Progress rept. no. 2 for 15 Sep-15 Dec 49 on Contract W36-039-sc-38202. 1 Jan 50, 14p. 3 refs.
Order from LC mi$2.40, ph$3.30 PB 139 946

The work during the period covered by this report has been devoted to an attempt to clarify the visualization of energy relationships in multiply-oscillating systems and also to generalize the stability criteria. The notation employed is the same as in the first report, and the equations and figures are numbered in sequence following the numbers used in the first report. (See also PB 139 945)

Electrical Engineering Research Lab., U. of Illinois, Urbana.
THEORETICAL INVESTIGATION OF OSCILLATOR CIRCUITS, by Norman R. Scott. Progress rept. no. 3 for 15 Dec 49-15 Mar 50 on Contract W36-039-sc-38202. 1 Apr 50, 20p. 2 refs.
Order from LC mi$2.40, ph$3.30 PB 139 944

In extension of previous work, this report considers first a question of the stability of two simultaneous oscillations and then a generalization of the single-loop oscillator, as exemplified by a tuned-plate oscillator. The major part of the report is devoted to the question of frequency stability. The effect of amplitude perturbations on the emitted spectrum is considered first, and then the problem of instantaneous variations of frequency as a function of operating voltages is attacked. Work is continuing on this latter phase of the problem. (See also PB 139 946)

Electrical Engineering Research Lab., U. of Illinois, Urbana.
THEORY OF OSCILLATOR CIRCUITS, by G. A. Petticrew and Bernard Silverman. Interim progress rept. for 15 July-15 Oct 50 on Contract DA 36-039-sc-205. 15 Nov 50, 10p. 7 refs. Rept. no. 205-1.
Order from LC mi$1.80, ph$1.80 PB 140 018

Utilizing results obtained by van der Pol and others, the power demands on a synchronizing source to hold a free-running tuned-grid oscillator in synchronization are investigated. After a general expression for the average power drawn from the synchronizing source is developed, two specific cases are considered. In the first case it is shown that under the assumed conditions no power is extracted from the synchronizing source when as the detuning changes, the amplitude of the synchronizing voltage is allowed to vary in order to maintain the oscillation amplitude at its initial value. The second case shows that for a fixed amplitude of the synchronizing voltage, the synchronizing source may either supply power to the circuit or absorb power, depending on the amount of detuning.

Electrical Engineering Research Lab., U. of Illinois, Urbana.
THEORY OF OSCILLATOR CIRCUITS, by G. A. Petticrew and Bernard Silverman. Interim progress rept. for 15 Oct 50-15 Jan 51 on Contract DA 36-039-sc-205. 15 Feb 51, 27p. 6 refs. Rept. no. 205-2.
Order from LC mi$2.70, ph$4.80 PB 140 017

Considering the effects of grid current, an expression is developed for the power required to synchronize an oscillator with a signal injected in the oscillator grid circuit and a method is given for the calculation of this power. It is shown that under typical operating conditions the response curves for this system are practically the same as those obtained with the signal injected in the tuned circuit. It is further shown that the stability criteria for these two cases are identical. Curves of relative power versus detuning for constant synchronizing voltage and also for constant output amplitude are plotted and interpreted. (See also PB 140 018)

Electrical Engineering Research Lab., U. of Illinois, Urbana.
THEORY OF OSCILLATOR CIRCUITS, by G. A. Petticrew and Bernard Silverman. Interim progress rept. for 15 Jan-15 Apr 51 on Contract DA 36-039-sc-205. 15 May 51, 20p. 8 refs. Rept. no. 205-3.
Order from LC mi$2.40, ph$3.30 PB 140 011

An analysis is given for the synchronization of the Colpitts and Hartley oscillators. The results indicate that the behavior of these circuits is identical to that of the tuned-plate oscillator under the assumptions made. However it is pointed out that the method of analysis may be oversimplified, and the systems described by differential equations of order higher than the second must be studied more closely before positive results can be obtained. The groundwork is laid for an attempt to establish general criteria which will insure the existence of a stable periodic solution for higher order systems, and the general plan of attack on this problem is outlined. (See also PB 140 017)

Electrical Engineering Research Lab., U. of Illinois, Urbana.
THEORY OF OSCILLATOR CIRCUITS, by G. A. Petticrew and Bernard Silverman. Interim progress rept. for 15 Apr-15 July 51 on Contract DA 36-039-sc-205. 15 Aug 51, 15p. 8 refs. Rept. no. 205-4.
Order from LC mi$2.40, ph$3.30 PB 140 012

The work during this period has included a development of the general form of the differential equation for sinusoidal oscillators which have the synchronization characteristics shown in Report No. 205-2. (See also PB 140 011)

Electrical Engineering Research Lab., U. of Illinois, Urbana.
THEORY OF OSCILLATOR CIRCUITS, by George A. Petticrew and Bernard Silverman. Interim progress rept. for 15 July 51-15 Jan 52 on Contract DA 36-039-sc-205. 15 Feb 52, 19p. 2 refs. Rept. no. 205-5.
Order from LC mi$2.40, ph$3.30 PB 140 013

During this interval the study of oscillating systems whose behavior can be represented by third-order differential equations was continued, and the further application of the technique of a three-dimensional phase space to determine the existence and nature of periodic solutions in these systems was investigated. (See also PB 140 012)

Electrical Engineering Research Lab., U. of Illinois, Urbana.
THEORY OF OSCILLATOR CIRCUITS, by George A. Petticrew, Charles A. Jakowatz, and Bernard Silverman. Interim progress rept. for 15 Jan-15 Apr 52 on Contract DA 36-039-sc-205. 15 May 52, 35p. 8 refs. Rept. no. 205-6.
Order from LC mi$3.00, ph$6.30 PB 140 014

During this interval attention was directed to the development and application of techniques for determining the frequencies and amplitudes of oscillation in a system. (See also PB 140 013)

Electrical Engineering Research Lab., U. of Illinois, Urbana.
THEORY OF OSCILLATOR CIRCUITS, by George A. Petticrew, Charles V. Jakowatz, and Bernard Silverman. Interim progress rept. for 15 Apr-15 July 52 on Contract DA 36-039-sc-205. 15 Aug 52, 33p. 4 refs. Rept. no. 205-7.
Order from LC mi$3.00, ph$6.30 PB 140 133

In the last report a method was presented for determining the frequency and amplitude of oscillation of a linear circuit associated with a single nonlinear element. One requirement of this method was that the problem analyzed be represented by a Taylor's series. As presented, this restricted the oscillator operation to Class A. In this report a method is presented to overcome this serious restriction so that this method can be extended to the important case of Class C.

Electrical Engineering Research Lab., U. of Illinois, Urbana.
THEORY OF OSCILLATOR CIRCUITS, by George A. Petticrew, Charles V. Jakowatz, and Bernard Silverman. Interim progress rept. for 15 Oct 52-15 Jan 53 on Contract DA 36-039-sc-205. 15 Feb 53, 36p. 1 ref. Rept. no. 205-8.
Order from LC mi$3.00, ph$6.30 PB 140 132

During this interval, work has been continued in two directions: (a) the extension of the analysis of a network containing two nonlinear elements, and (b) the development of methods for approximating tube characteristics. (See also PB 140 133)

Electrical Engineering Research Lab., U. of Illinois, Urbana.
THEORY OF OSCILLATOR CIRCUITS, by George A. Petticrew and Bernard Silverman. Interim progress rept. for 15 Jan-15 Apr 53 on Contract DA 36-039-sc-205. 15 May 53, 20p. Rept. no. 205-9.
Order from LC mi$2.40, ph$3.30 PB 140 131

The research carried out during this period has consisted of experimental verification of the methods of analysis and design procedures developed in previous reports and the extension of the methods to cover four-terminal nonlinear devices. The second of these objectives was undertaken in order to make possible the analysis of oscillators in which grid current is an important factor. (See also PB 140 132)

Electrical Engineering Research Lab., U. of Illinois, Urbana.
THEORY OF OSCILLATOR CIRCUITS, by George A. Petticrew and Bernard Silverman. Final rept. for 15 Oct 52-15 Sep 53 on Contract DA 36-039-sc-205. 15 Oct 53, 97p. 30 refs.
Order from LC mi$5.40, ph$15.30 PB 140 130

In this part the steady-state analysis of a particular network configuration containing two nonlinear elements associated with other linear network elements is presented. The nonlinear elements may be either triode or pentode vacuum tubes or any other nonlinear devices having similar characteristics. The network is considered both as a system driven by sinusoidal generators and as a self-excited oscillator whose output is almost sinusoidal. By restricting the analysis to a range in which there is no grid current flow in the vacuum tubes, these vacuum tubes (or nonlinear elements) can be treated as two-terminal devices and the steady-state behavior of the system can be determined. The analysis is then applied to a two-stage self-excited oscillator, and the results of this analysis are shown to be in good agreement with values measured in the laboratory. The problem dealt with in this portion of the report is that of analyzing an oscillator which involves two distinct currents which are nonlinearly related to the voltages producing them. (See also PB 140 131)

Electron Tube Lab., U. of Michigan, Ann Arbor.
LARGE-SIGNAL TRAVELING-WAVE AMPLIFIERS, by Joseph E. Rowe. Technical rept. no. 20 on Contract AF 30(602)1596. Dec 56, 35p. 4 refs. 2562-1-T; RADC-TN-57-115; AD-114 373.
Order from LC mi$3.00, ph$6.30 PB 135 511

The characteristics of traveling-wave amplifiers under large-signal conditions are discussed briefly and the large-signal equations, which were derived taking into account large values of the gain parameter C and the effects of a-c space charge and series loss along the helix, are presented. The large-signal equations are valid with reasonable approximations for all values of the operating parameters which are encountered in typical large-signal tubes. The solution of the equations is also briefly discussed.

Electronics Research Lab., U. of California, Berkeley.
MUTUAL COUPLING BETWEEN THIN SLOTS, by N. Kusnezov. 15 Dec 58, 46p. 9 refs. Rept. no. 77; IER Series no. 60, Issue no. 220.
Order from LC mi$3.30, ph$7.80 PB 139 940

In this report we set out to investigate some properties of the coupled slots on an infinite ground plane, each slot being backed by a separate waveguide. The waveguides and the gound plane have been assumed to be infinitely conducting. Slots were taken to be thin: $d << \lambda$ in the first half of the paper, or $2 \ln \frac{4\ell}{d} \gg 1$ in the second part.

Electronics Research Lab., U. of California, Berkeley.
PRODUCTION AND CONTROL OF ELECTRON BEAMS, by D. H. Sloan and Charles Süsskind. Scientific rept no. 1 (Annual, 1957-58) on Contract AF 19(604)2270. June 58, 87p. 38 refs. Series no. 60, Issue no. 203; AFCRC TN-58-183; AD-152 440.
Order from LC mi$4.80, ph$13.80 PB 135 875

Part I: Part I concerns the investigation of a space-charge-balanced flow, a generalized method of constraining an electron beam intended for use in beam-type tubes (klystrons and traveling-wave tubes) with axial symmetry in the presence of an axial magnetic field. Part II. An investigation is described of the problem of controlling and modulating high-intensity electron beams of the sort employed in high-power microwave tubes. Part III: Activity is reported on a

theoretical and experimental investigation of the properties of certain gaseous devices, particulary with regard to the plasma of an arc as a source of electrons for cross-field tubes at extremely high power.

Electronics Research Lab., U. of California, Berkeley.
QUARTERLY PROGRESS REPORT, 1 JANUARY - 31 MARCH 1957. Progress rept. no. 16 on Contract N7onr-295(29). Apr 57, 13p. Series no. 60, Issue no. 16.
Order from LC mi$2.40, ph$3.30 PB 135 246

Contents:
Diffraction of plane waves by a circular aperture in an essentially infinite plane conducting sheet
Scattering from figures of revolution
Arrays of single mode slots in multimode waveguide
Microwave radiometry
Strip transmission lines with curved plates
Dielectric waveguide image system
Strip transmission-line filter
Investigation of the radiating properties of a parallel, zig-zag, slow wave structure at x-band - A sinuate antenna
Transistor circuit research
Airframe parameter measurement
(See also PB 135 551)

Electronics Research Lab., U. of California, Berkeley.
QUARTERLY PROGRESS REPORT 1 APRIL-30 JUNE 1957. Rept. on Contract N7onr-295(29). July 57, 22p. Series no. 60, Issue no. 17.
Order from LC mi$2.70, ph$4.80 PB 135 612

Progress is reported on: scattering from figures of revolution; arrays of single mode slots in multimode waveguide; microwave radiometry; parallel-slot mutual coupling; strip transmission lines with curved plates; a sinuate antenna; multi-mode, multi-frequency transmission; ferrite-filled slot antenna; experimental determination of electric fields in a ferrite loaded waveguide; a ferrite rod antenna; network theory; diffraction by a strip at oblique incidence; transistor circuit research; airframe parameter measurement; and a study of non-linear control systems.

Electronics Research Lab., U. of California, Berkeley.
QUARTERLY PROGRESS REPORT, 1 JULY-30 SEPTEMBER 1957, by S. Silver. Progress rept. no. 18 on Contract N7onr-295(29). 15 Oct 57, 16p. 3 refs. Series no. 60, Issue no. 18.
Order from LC mi$2.40, ph$3.30 PB 136 487

Contents:
Diffraction of plane waves by a circular aperture in an essentially infinite plane conducting sheet
Backscattering cross-section of oblate spheroids
Arrays of single mode slots in multimode waveguide
Microwave radiometry
Stripline between curved boundaries
Ferrite space excited-slot antenna
Frequency independent antennas
Network theory
Transistor circuit research
A study of nonlinear control systems

Electronics Research Lab., U. of California, Berkeley.
STEADY STATE TRANSMISSION THROUGH A NETWORK CONTAINING A SINGLE TIME VARYING ELEMENT, by C. A. Desoer. Rept. on Contract AF 18(600)1521. 22 Dec 58, 34p. 10 refs. IER Series no. 60, Issue no. 221; AFOSR TN-59-106; AD-210 388.
Order from LC mi$3.00, ph$6.30 PB 139 993

The purpose of this paper is to present a new method of steady state analysis of a linear network, of arbitrary degree of complexity, containing a single periodically varying element. The proposed method makes full use of circuit theoretic ideas, such as impedance matching and tearing apart and of iterating techniques which are particularly suitable for automatic computation. The proposed method has the additional feature of leading to the amplitude and phase of all side bands and of giving a bound on the error if the iterations are stopped at any particular point.

General Electric Co., Schenectady, N. Y.
INVESTIGATION OF VARIOUS ACTIVATOR-REFRACTORY SUBSTRATE COMBINATIONS, by John H. Affleck. Scientific rept. no. 3 on Contract AF 19(604)4093. 5 Mar 59, 11p. 2 refs. AFCRC-TN-59-150; AD-212 074.
Order from LC mi$2.40, ph$3.30 PB 139 900

Cesium on molybdenum silicide gives a greater reduction in work function than either cesium-molybdenum or cesium-tungsten. The evaporation rates have not yet been determined but this system looks rather promising in view of the low work function.

General Electric Microwave Lab., Palo Alto, Calif.
COMPUTER APPLICATIONS, by V. Met and M. P. Forrer. Quarterly progress rept. for 1 Apr-30 June 58 on Contract Nonr-2127(00). 1958 19p. 3 refs. Rept. R58ELM 79-2.
Order from LC mi$2.40, $3.30 PB 139 828

Since effort has been directed towards the ultimate 20 percent bandwidth operation necessary for 1 mu sec pulses at X-band, considerable experimental difficulties were encountered. The development of a TWT pulse generator has not been carried beyond preliminary cavity design problems. A ceramic low-noise tube can be used which is currently in the stage of development under a separate project.

George Washington U., Washington, D. C.
PROGRESS REPORT OF CONTRACT N7onr-41906, by Nelson T. Grisamore. Rept. for 15 Feb 57-1 1 June 58. 31p.
Order from LC mi$3.00, ph$6.30 PB 139 969

The research reported in this paper can be divided into two categories; devices and circuits. Experimental work with the coincidence tube has been completed. Experimental work on the ferrite modulator

is just beginning and results will be reported as soon as obtained. Efforts in the area of three-valued logic have been confined mainly but not entirely to electronic circuit design. Work on the reliable computer circuits has been in the area of both logical and electronic circuit design.

Haloid Co., Rochester, N. Y.
PERFORMING RESEARCH ON NEW APPROACHES TO PRINTED CIRCUITRY. Scientific rept. no. 6, 1 June-31 Aug 57, on Contract AF 19(604)1736, 1 Sep 57, 27p. AFCRC-TN-57-794; AD-133 751.
Order from LC mi$2.70, ph$4.80 PB 135 502

Performance tests on vacuum evaporated chromium resistors and chemically deposited tin oxide resistors have been carried out. Silicon monoxide overcoating is effective in protecting glass-based chromium films to 300°C. Various overcoatings for higher temperature service and protection of ceramic-based components have been tried without success. Quantitative measurements of corona charging characteristics of materials for use in making electrostatic printing masters have been made.

Hughes Aircraft Co., Culver City, Calif.
ATOMIC AND MOLECULAR RESONANCES FOR MILLIMETER-WAVE GENERATION, by H. Lyons, G. Birnbaum and M. L. Stitch. Final rept. on Contract DA 36-039-sc-73080. 1 July 57, 88p. 15 refs. AD-152 928.
Order from LC mi$4.80, ph$13.80 PB 139 953

Beam maser: The experimental ammonia maser oscillator sustained high focuser voltages, exhibited excellent vacuum properties, and gave a steady output signal. A sensitive and accurate method of measuring maser amplifier noise figure was proposed which used an input noise source at 4°K. The absolute power output of the ammonia maser was measured by using 3 different beam collimators and a fine-control gas-flow system. The best power output was near 10^{-10}w. Techniques are proposed for testing the ammonia-gettering action of titanium, and 2 experimental model pumps are described. Millimeter-beam masers and sources: Investigations were made of (1) molecules for use in the millimeter region, (2) means of coupling selected molecules to an electromagnetic field at millimeter wavelength, and (3) means for the improvement of maser performance in general. Solid-state spin masers: An analysis of the transient behavior of 2-level spin systems is given which considered the effects of the transverse relaxation time and the radiation damping time. A comparison of methods of preparing mixed metal fluosilicates by double decomposition showed that $BaSiF_6$ was more satisfactory than H_2SiF_6. Crystals of lanthanum-gasolinium-cerous ethylsulfate nonahydrate (H_2O) were prepared from a solution in which the cation ratio was La:Gd:Ce = 500:2.5:1. A 3-level maser oscillator unit using $Gd(C_2H_5SO_4)_3 \cdot 9H_2O$ doped with cerium produced 400-μw output power at 8.9 kmc with a pumping power of 60 mw.

Johns Hopkins U., Baltimore, Md.
ON OSCILLATORS WITH LARGE FREQUENCIES (I); ON THE RATIO $f(t \to cf^{-a}(t))/f(t)$ (II); ON FUNCTIONS REPRESENTABLE AS A DIFFERENCE OF CONVEX FUNCTIONS (III), by Philip Hartman. Technical rept. no. 9 on Contract AF 18(603)41. Feb 59. 21p. 2 refs. AFOSR-TN-59-114; AD-210 399.
Order from LC mi$2.70, ph$4.80 PB 139 939

Kansas U., Lawrence.
RESEARCH AND DEVELOPMENT STUDIES OF ELECTRETS, by G. G. Wiseman, J. R. Beeler and others. Quarterly progress rept. nos. 2-4, 1 Dec 54-31 Aug 55, on Contract DA 36-039-sc-63111. 3 nos.
Order from LC

Quarterly progress rept. no. 2, 1 Dec 54-28 Feb 55, 51p. mi$3.60, ph$9.30, PB 127 987
Quarterly progress rept. no. 3, 1 Mar-31 May 55, 25p. mi$2.70, ph$4.80, PB 127 988
Quarterly progress rept. no. 4, 1 June-31 Aug 55, 37p. mi$3.00, ph$6.30, PB 127 989
(See also PB 127 986)

Kansas U., Lawrence.
RESEARCH STUDIES ON ELECTRETS, by N. Baumann, H. Brown and others. Quarterly progress rept. no. 4, 15 Nov 51-15 Feb 52, on Contract DA 36-039-sc-5467. Mar 52, 42p.
Order from LC mi$3.30, ph$7.80 PB 127 986

The purpose of these studies on electrets is to learn of their fundamental nature and to study the feasibility of their application in electrical devices. The studies are divided into Task A. Production and Measurement, Task B. Investigation of Electret Substances, Task C. Study of Electret Characteristics, and Task D. Practical Applications.

Kearfott Co., Inc., Little Falls, N. J.
STUDY OF ENVIRONMENTAL PROBLEMS AND ERROR COMPENSATION AS APPLIED TO A VERTICALLY ERECTED, COMPASS SLAVED, THREE-GYRO STABLE PLATFORM, by E. Z. Gabriel and M. Kerpchar. Rept. on Contract AF 33(616)2054. [1953] 211p. 10 refs. WADC Technical rept. no. 54-324; AD-73 999.
Order from LC mi$9.60, ph$33.30 PB 140 359

Means were sought for reducing the vertical and azimuth errors, caused by aircraft accelerations and other environmental conditions, of a 3-gyro stable platform slaved to North. The analysis of various schemes to compensate acceleration errors indicated that an undamped Schuler tuned system would be the most accurate under all flight conditions. However, the inaccuracies of the 3-gyro platform make it inadvisable to operate the platform in this manner except during the brief period of aircraft turning, fore-aft, and high centripetal accelerations. Under most operating conditions, operation as a damped-Schuler system is recommended. When operated in accordance with the damped-Schuler principle, the signal is corrected both for Coriolis and rhumb-line accelerations by means of simple computers. In this type of operation, the vertical channels are practically insensitive to transient input signals with periods of 2 min or less in the case of a system damped to 0.5

of critical. Only one or even no external input is required during flight; this reduces sensitivity to external disturbances and prevents the accumulation of instrumentation errors. If the pendulous element is capable of responding to an acceleration of at least 1 g, this compensation device will reduce platform errors caused by aircraft accelerations to a fraction of the random drift error of the gyros.

Knights, James, Co., Sandwich, Ill.
HIGH TEMPERATURE V H F CRYSTAL UNITS, by Otis F. Ivie. Quarterly progress rept. no. 1, 1 Dec 55-29 Feb 56, on Contract DA 36-039-sc-70176. [1956] 10p. 2 refs.
Order from LC mi$1.80, ph$1.80 PB 140 010

CR-32/U type crystals were tested to a temperature of 135°C. Their frequency temperature coefficients at 125°C were too high for generally acceptable oven control use at that temperature. 40 mc and 80 mc crystals cut to various angles and tested to 200°C, confirmed tentative graphs for ZZ' angle vs turning point.

Knights, James, Co., Sandwich, Ill.
HIGH TEMPERATURE VHF CRYSTAL UNITS, by Otis F. Ivie. Quarterly progress rept. no. 2, 1 Mar-31 May 56, on Contract DA 36-039-sc-70176. [1956] 12p. 4 refs.
Order from LC mi$2.40, ph$3.30 PB 140 129

Study of previous aging investigations lead to use of aluminum plating for 125° C aging.

Knights, James, Co., Sandwich, Ill.
HIGH TEMPERATURE VHF CRYSTAL UNITS, by Otis F. Ivie and Keith Schiager. Quarterly progress rept. no. 3, 1 Apr-31 Aug 56 on Contract DA 36-039-sc-70176. [1956] 23p. 2 refs.
Order from LC mi$2.70, ph$4.80 PB 140 120

Equipment and methods were re-examined and changed in light of new requirements. (See also PB 140 129)

Material Lab., New York Naval Shipyard, Brooklyn.
RESEARCH AND DEVELOPMENT OF EXPERIMENTAL BRAID TREATMENTS ON SAMPLES OF TYPE MSCA CABLE CONDUCTORS SUBMITTED BY VARIOUS MANUFACTURERS. Final rept. 5 June 57, 21p. Lab. project 5248-107.
Order from LC mi$2.70, ph$4.80 PB 138 001

Methods and materials for improving the abrasion resistance and imperviousness to hydraulic oil of individual glass braided extruded silicone rubber insulated conductors for Type MSCA cable were investigated. Conductors with various braid treatments were evaluated and it was found that Nylon type coating materials were superior. Conductors with combination glass and Dacron braid also exhibited improved abrasion resistance. The degree of improvement attained in these experimental sample conductors is not considered optimum and further development work on this subject is recommended.

Mellon Inst. of Industrial Research U. of Pittsburgh, Pa.
HIGH TEMPERATURE PRINTED CIRCUITRY, by G. H. Young, C. H. T. Wilkins and others. Quarterly rept. no. 4, 3rd series, 1 July-30 Sep 57, on Computer Components Fellowship no. 347, Contract AF 19(604)1959. 1957, 41p. 23 refs. AFCRC TN-57-767; AD-133 709.
Order from LC mi$3.30, ph$7.80 PB 136 579

The findings of the program on high temperature printed circuitry are summarized briefly, and the several techniques for circuit fabrication are evaluated in the light of the 200° C temperature specification for this year and the 750° C specification for the coming year. The conductivity of silver enamels has been found to remain high with silver contents as low as 26 percent. Platinum resistor films were found to have a linear temperature coefficient of resistance from 28 to 500° C, with a change in resistance of ✦ 18 percent over this temperature range. Boron carbide thermistor ılms are stable in air above 750° C, but crack when temperature cycled between 200 to 300° C. Silicon carbide and zirconium carbide enamel resistors were successfully formed using suitable wetting agents. Irreversible increases in resistance were observed in testing vacuum deposited gold-palladium resistor films to 500° C. Preliminary attempts to form aluminum oxide capacitor dielectric films are discussed. A simple method of attaching lead wires to high temperature printed ceramic circuits using properly formulated enamels is described. These connections function satisfactorily at least up to 750° C.

Mellon Inst. of Industrial Research, U. of Pittsburgh, Pa.
HIGH TEMPERATURE PRINTED CIRCUITRY, by G. H. Young, C. H. T. Wilkins and others. Quarterly rept. no. 6, third series, 1 Jan-31 Mar 58, on Computer Components Fellowship no. 347, Contract AF 19(604)1959. Apr 58, 31p. 12 refs. AFCRC-TN-58-152; AD-152 383.
Order from LC mi$3.00, ph$6.30 PB 135 871

Enamel resistors based upon molybdenum disilicide ($MoSi_2$) have been found to have excellent oxidation resistance at elevated temperatures. Vacuum evaporated gold-palladium resistor films from room temperature to 740°C are also under study. Two types of high temperature capacitors made were conducting silver enamel electrodes formed on opposite sides of a thin alumina substrate, and an air dielectric capacitor, fabricated by means of enamel bonding techniques.

Microwave Associates, Inc., Burlington, Mass.
DEVELOPMENT OF DIODE TYPE 50649B, by R. B. Collins and R. P. Rafuse. Quarterly progress rept. no. 1, 1 June-31 Aug 58, on Contract DA 36-039-sc-78021. [1958] 44p.
Order from LC mi$3.30, ph$7.80 PB 140 250

The experimental work which will lead to an optimum design for the type 50649B X-Band Microwave Mixer Diode is discussed. The factors included in the experimental determination are the ceramic material and the internal geometry of the diode case. The

design and construction of an overall noise figure test set which will be used to determine compliance with the requirements of Signal Corps Specification SCL-7003/1 are discussed. The design of a 60 Mc preamplifier with a continuously adjustable noise figure in the range 2.5 to 4.5 db is described.

Microwave Associates, Inc., Boston, Mass.
RESEARCH AND DEVELOPMENT OF X-BAND CRYSTAL MIXER TEST EQUIPMENT. Final rept. 1 May 55-31 Aug 56, on Contract DA 36-039-sc-64669. [1956] 77p. AD-112 038.
Order from LC mi$4.50, ph$12.30 PB 137 760

An X-band (9375 MC) microwave crystal diode test set, employing some new techniques has been constructed. The test set is capable of measuring VSWR, conversion loss, overall noise figure, noise temperature and IF impedance. Computed measurement accuracies of the various tests and results of tests on a group of fifty (50) crystals are given.

Microwave Components Labs., Sylvania Electric Products, Inc., Mountain View, Calif.
DEVELOPMENT OF LOW-NOISE BACKWARD-WAVE AMPLIFIER TUBE, by Robert E. Vehn. Quarterly progress rept. no. 6, 15 June-15 Sep 58, on Contract DA 36-039-sc-73181. [1958] 13p.
Order from LC mi$2.40, ph$3.30 PB 140 248

Progress is reported for work accomplished on fabrication techniques for the various elements of the tube. The greatest effort has been devoted to the construction of the slow-wave structure. Modifications have been made to the electron gun and the transducers. Masking techniques for the preparation of evaporated-metal attenuators are being developed with good results.

Microwave Lab., Stanford U. Calif.
BASIC MICROWAVE RESEARCH. Scientific rept. no. 3, 1 Oct-31 Dec 57, on Contract AF 19(604)1930. Jan 58, 13p. M.L. rept. no. 474; AFCRC-TN-58-101; AD-146 798.
Order from LC mi$2.40, ph$3.30 PB 135 500

The purpose of this research activity is to undertake basic investigations of problems connected with the generation and transmission of high peak or average power in the microwave region of the spectrum.

Microwave Lab., Stanford U., Calif.
BASIC MICROWAVE RESEARCH, by M. Chodorow. Scientific rept. no. 8, 1 July-30 Sep 58, on Contract AF 19(604)1930. Nov 58. 26p. 10 refs. M. L. rept. no. 551; AFCRC-TN-59-108; AD-208 772.
Order from LC mi$2.70, ph$4.80 PB 139 908

Electron-Velocity Spectrograph. The work of this project has been completed during the past quarter with a series of experimental investigations. Connected-Ring Structures. The work of this project has also been completed. Coupled-Cavity Theory. A first-order field analysis of an actual propagating structure has been made, which leads to a dispersion relation which agrees fairly well with experiments. Work has been started on the analysis of an infinite cascade of symmetric 2n port networks. Electron Gun Study. Preliminary results indicate that values of microperveance and area convergence of approximately twenty should be possible. Plasma Physics Studies. A new program of plasma physics studies has been established.

Microwave Lab., Stanford U., Calif.
MOLECULAR OSCILLATOR STUDY, by E. T. Jaynes. Final rept. for 1 Mar 56-31 Aug 58 on Contract DA 36-039-sc-71178. Sep 58, 25p. 5 refs. ML rept. no. 547.
Order from LC mi$2.70, ph$4.80 PB 140 249

Contents:
Application of the neoclassical theory to problems of amplitude and frequency stability in molecular-beam maser oscillators

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
APPLICATION OF FERRITE MATERIALS TO MICROWAVE INSTRUMENTATION, by Max Sucher. Final rept. on Contract AF 30(602)1440. 24 Apr 57, 65p. 22 refs. Rept. R-572-57; PIB-500; RADC TR-57-117; AD-131 166.
Order from LC mi$3.90, ph$10.80 PB 139 936

New or improved techniques of microwave measurements were investigated through the use of the special properties of ferrite materials. Consideration was given to possible techniques by which variation in ferrite properties can be used with suitable waveguide geometry to give a variable directional coupler. Such a device can, in addition to performing its primary function, act as a variable power divider, a variable attenuator, and, by the addition of a ferrite phase shifter, a variable impedance. Various circulator circuits were also considered. The waveguide devices employing ferrites in a coupling region have potential application to broadband variable directional couplers, attenuators, power dividers, circulators, and electronically tuned matching elements. Further work is needed to obtain optimum broad-banding by appropriate changes of geometry or dielectric loading in the coupling region. The investigation of coaxial ferrite devices indicated the possibility of a broadband coaxial gyrator utilizing a mode (not TEM) which propagates down to dc. Variations of this basic scheme utilizing metallic fin loading and nonmagnetic dielectric loading were studied and promising theoretical results obtained. In the case of rectangular guide elements, experimental verification of some of the theoretical analysis was obtained but no complete experimental study was undertaken to exploit the analysis fully.

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
ELECTRONIC WARFARE APPLICATION OF MICROWAVE ELECTRONICS. Quarterly rept. no. 4, 15 Oct 57-15 Jan 58, on Contract AF 30(602)1650. 14 Mar 58, 27p. Rept. no. R-600.4-58; PIB-528.4; RADC TN-58-138; AD-148 736.
Order from LC mi$2.70, ph$4.80 PB 136 489

Phase I: Engineering investigation of design techniques for filters. A strip line band pass filter using coupled line inductive elements and a quarter wave coupled cavity filter using lumped capacitors as part of the resonant cavity circuitry were constructed for pass bands centered near 100 mc/sec. Phase II: Synthesis of variable long time delay lines. This study has been concerned with the synthesis of networks whose delay characteristics are time variable.

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y..
HIGH-FREQUENCY COMPENSATION OF A DRIFT TRANSISTOR, by Sid Deutsch. Rept. on Contract AF 30(602)1648. 19 Jan 59, 22p. Rept. R-705-58; PIB-633; RADC TN-59-47; AD-210 396.
Order from LC mi$2.70, ph$4.80 PB 139 949

For a vacuum-tube amplifier, high-frequency compensation using an infinite LC ladder with identical elements yields maximally-flat amplitude response. The same type of compensation is investigated in connection with a drift transistor. The design criterion for maximally-flat amplitude response is derived. In a numerical example applied to the 2N247 transistor, the amplitude response develops a 10.3DB peak immediately above the nominal cutoff frequency of the ladder, although considerable improvement in bandwidth is obtained. The time delay response also undergoes violent fluctuations. The conclusion is that the identical-element ladder is poor compensation for a drift transistor. Instead, given a desired frequency response it should be possible to synthesize an infinite RLC ladder of non-identical elements.

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
LEAKY WAVE ANTENNAS. II: CIRCULAR WAVEGUIDES, by L. O. Goldstone and A. A. Oliner. Rept. on Contract AF 19(604)2031. Jan 58, 39p. 8 refs. Rept. R-629-57; PIB-557; AFCRC TN-58-141; AD-152 367.
Order from LC mi$3.00, ph$6.30 PB 135 401

The propagation characteristics of leaky waves on slotted circular cylinders are derived by the methods described in a companion report for leaky rectangular waveguides. The cross-section of a typical leaky circular waveguide is represented by a radial transmission line network incorporating a lumped terminating admittance which characterizes the slot discontinuity and the external region. The expression for the lumped admittance is obtained by combining an integral equation solution with a variational procedure. The resonances of this transverse network, which yield the complex propagation constants for the leaky waves, are solved by perturbation techniques to produce results in simple and practical form. Solutions are obtained for leaky waves corresponding to two different excitations of a slotted cylinder and these results are shown to compare favorably with measured values.

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
LEAKY WAVE CONTRIBUTIONS TO THE FIELD OF A LINE SOURCE ABOVE A DIELECTRIC SLAB. PART II, by S. Barone and A. Hessel. Rept. on Contract AF 19(604)2031. 17 Dec 58, 42p. 1 ref. Research Rept. R-698-58; PIB-626; AFCRC-TN-59-134; AD-210 712.
Order from LC mi$3.30, ph$7.80 PB 139 910

The present report is a continuation of previous work on leaky wave resonances of a dielectric slab in free space. The leaky wave resonances are discussed in detail for the case of excitation by a magnetic line source parallel to the slab. It is shown that, as for the case of electric current excitation, these resonances exist and contribute to the field for certain frequencies and angles of observation. However, numerical analysis for the case of a polystyrene slab shows that the leaky wave field is comparable in strength to the surface wave field only very near the source. This fact makes the experimental detection of leaky wave effects on a dielectric slab very difficult.

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
MAGNETIC PULSE MODULATOR WITH BIASED DIODE LOAD, by E. J. Smith and K. T. Lian. Phase rept. on Contract AF 30(602)984. 10 Oct 56, 132p. 8 refs. Rept. no. R-501-56; PIB-431; RADC TN-57-87; AD-114 342.
Order from LC mi$6.90, ph$21.30 PB 136 690

The theory of the magnetic pulse modulator with biased-diode load is developed, and design procedures are outlined for conventional pulse-forming-network and pulse-clipping-reactor output circuits. Design examples are given for a low-power experimental circuit and a two-megawatt modulator. Test results, showing modulator line performance and output wave shapes, are given for the low-power magnetic modulator.

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
MICROWAVE ELECTRONICS. Quarterly rept. no. 2, 15 Mar 56-15 June 56, on Contract AF 30(602)1430. 15 July 56, 43p. 12 refs. Rept. no. R-494.2-56; PIB-424.2; RADC TN-56-458; AD-97 989.
Order from LC mi$3.30, ph$7.80 PB 136 600

Two rectangular waveguide circulators are being constructed in order to test the feasibility of several circulator-filter partition arrays. Each circulator consists of a short-slot hybrid junction and a folded magic T junction separated by a double 90° differential phase shift section. The analysis of the operation of this device leads to the conclusion that of all the circulators employing standard components this arrangement offers the most broadband operation. A maximally flat strip line filter having a 2% bandwidth centered at 5 kmc/sec. has been constructed. By the use of a simple tuning adjustment the performance of this filter has been optimized. The present model exhibits the desired passband but presents a midband insertion loss of 10 db. Other designs for narrow band filters in the vicinity of 5 kmc/sec. presented a lower insertion loss, but did not approach the design performance as closely. Methods of reducing the insertion loss of the maximally flat filter are being investigated.

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
MICROWAVE ELECTRONICS. Quarterly rept. no. 3, 15 June 56-14 Sep 56, on Contract AF 30(602)1430. 19 Dec 56, 48p. 14 refs. Rept. R-494.3-56; PIB-424.3; RADC TN-57-203; AD-114 498.
Order from LC mi$3.30, ph$7.80 PB 136 687

It is the purpose of this program to conduct investigations on components for the broadband transmission and reception of information in the microwave spectrum. The conversion of such signals into various forms appropriate for specific applications will be considered, such as the channeling of a single broad frequency spectrum into a group of narrow bands, and the conversion of frequency into amplitude. It is also an objective to study various components of a system such as the antenna from the point of view of broadbanding and minimum size. Such a program can involve the use of non-conventional types of transmission line such as strip line as applied to the design of minimal size antennas.

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
NETWORK REALIZABILITY THEORY AND ITS APPLICATION TO THE SYNTHESIS OF DISTRIBUTED PARAMETER MATCHING NETWORK, by L. J. Castriota and H. J. Carlin. Rept. on Contract AF 30(602)1709. May 58, 91p. 29 refs. Research rept. R-651-58; PIB-579; RADC-TN-58-154; AD-148 762.
Order from LC mi$5.40, ph$15.30 PB 135 866

A general theory of network realizability for linear, passive, time-invariant networks is presented from the point of view of energy conservation and causality. It is shown that four postulates defining the physical nature of a network suffice to give all the analytic properties of the network scattering matrix. These analytic properties define a bounded real scattering matrix, the possession of which is necessary and sufficient for an n-port network to satisfy physical realizability as stated by the given set of postulates. A theorem concerning the necessary and sufficient conditions for the existence of a Faltung-representation is proved and its implications discussed.

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
ON THE POSSIBILITY OF USING A TRAVELLING WAVE TUBE AS A GYRATOR, by G. Mourier. Rept. on Contract DA 36-039-sc-72327. 20 Feb 57, 4p. Rept. no. R-559-57; PIB-487.
Order from LC mi$1.80, ph$1.80 PB 137 663

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
A STRIP LINE TRAVELLING WAVE ANTENNA, by D. P. Martin and E. N. Torgow. Rept. on Contract AF 30(602)1430. 2 Nov 56, 51p. 18 refs. Rept. R-514-56; PIB-444; RADC TN-57-101; AD-114 358.
Order from LC mi$3.60, ph$9.30 PB 136 688

The design of a tilted plane traveling wave antenna which has a strip transmission line input is presented. The input impedance, the coupling from the strip line to the antenna, the propagation constant of the traveling wave, and the radiation pattern are considered in the design. Measurements made on an experimental antenna are presented to show that the antenna exhibits the characteristics of a traveling wave antenna and that the assumptions made in the analysis are justified as far as first order effects are concerned.

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
A TWO-MEGAWATT MAGNETIC MODULATOR, by Joseph Antin. Research rept. on Contract AF 30(602)1619. 27 Feb 57, 65p. 2 refs. Rept. no. R-551-57; PIB-470; RADC TN-57-188; AD-114 476.
Order from LC mi$3.90, ph$10.80 PB 136 689

A practical design for a two-megawatt magnetic modulator is discussed, and a description of the model constructed and experimental results are given. Substantial agreement between predicted and experimental results is obtained for linear resistive load operation with and without a pulse transformer, and with a pulse-forming network.

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
UNILATERALIZED COMMON COLLECTOR TRANSISTOR AMPLIFIER, by L. M. Vallese. Research rept. on Contract Nonr-839(05). 10 Oct 57, 28p. 3 refs. Rept. R-612-57; PIB-540.
Order from LC mi$2.70, ph$4.80 PB 136 671

A three terminal transformerless unilaterilized common collector amplifier is described. The device has an active feedback path and uses two complementary type transistors in hook connection. Very high input impedances, up to $r_m/2$, and very low output impedances, from $r_e + r_b/2$ to $r_e + r_b(1-\alpha)$, may be realized. Various compensating circuits for low and high audio frequencies are described; furthermore means to reduce the dependence of the compensation upon bias point and temperature are discussed. Extensive experimental verifications are included.

Minnesota U., Minneapolis.
A STUDY OF NOISE IN GAS DISCHARGE LAMPS, by A. Van Der Ziel. Rept. on Electronic Tubes and Transistors, Contract AF 33(616)3337. Nov 58, 59p. 3 refs. WADC Technical rept. 58-548; AD-204 803.
Order from LC mi$3.60, ph$9.30 PB 140 186

The study of noise in gas discharge lamps gives information about the basic mechanisms causing the noise. In addition such studies may be used as a tool for the study of the physics of the discharge. The obtained results indicate that the noise temperature of the discharge is the most significant quantity. At sufficiently high frequencies the noise temperature is practically independent of the mode of coupling and seems to be equal to the electron temperature within the limit of accuracy. The influence of the cathode fall region and of the ion sheath around immersed probes and under wrapped-around probes on the impedance and the noise is indicated. When probe current is drawn, immersed probes give shot noise in addition to

the thermal noise of the ion sheath and the plasma. The arrangement of taking the noise signal between a single wrapped-around probe and the grounded anode shows promise as a noise source at megacycle frequencies and provides a simple means for obtaining the electron temperature of the plasma.

Motorola, Inc., Phoenix, Ariz.
TRANSISTOR CRYSTAL OSCILLATOR CIRCUITRY, by W. McSpadden, R. J. Shedko, and T. G. Evans. Final progress rept. for 1 July 56-15 Aug 57 on Contract DA 36-039-sc-72837. 23 Aug 57, 157p. 19 refs. P-2208-4.
Order from LC mi$7.50, ph$24.30 PB 139 070

The analytical approach presented in this report is based upon the power relationships in feedback oscillator and has been simplified considerably by graphical techniques. Step-by-step design data sheets are given for four common circuits and are followed by six specific design examples. These are written with the applications engineer in mind who has little time for a theoretical study of the subject. The report includes methods for prediction of output power and voltage and for the design of the feedback network. Sections are included on frequency and frequency stability, crystal characteristics, transistor considerations, and high-frequency experimental work.

National Aeronautical Establishment (Canada).
EXPERIMENTS WITH SCREENS AND GRIDS FOR SUPPRESSING JET ENGINE NOISE, by H. U. Wisniowski. Oct 58, 29p. 3 refs. Lab. rept. LR-231.
Order from LC mi$2.70, ph$4.80 PB 140 091

Experiments were made with noise suppressors of conventional screen and newly developed grid type. These devices were installed in an exhaust duct of a jet engine test cell. The sound level reductions obtained which could be applied practically amounted to 16-1/2 db. Higher reductions (up to 20 db.) were penalized by the adverse influence of the suppressor on tailpipe temperature and engine thrust.

Naval Air Test Center, Patuxent River, Md.
GENERAL VF AUDIO SYSTEMS, CORRECTION OF DEFICIENCIES IN. Rept. no. 1 (Final) on Proj. TED no. PTR EL 41069. 21 Apr 55, declassified 12 Feb 58. 20p. 5 refs. Serial ET 314-059.
Order from LC mi$2.40, ph$3.30 PB 140 095

This project covers the development of a suitable system to overcome the deficiencies in audio power output in VF type aircraft caused by the interaction of equipment audio power output circuits. Suitable isolation circuitry was devised which utilized the latest developments in transistorized amplifiers. The desired results were obtained with negligible increase in weight and primary power consumption and without modification to existing equipments.

Naval Ordnance Test Station, China Lake, Calif.
NOTS TEST DEPARTMENT STANDARD PRACTICE FOR RANGE PARTY-LINE COMMUNICATION SYSTEM, by B. W. Pike. Oct 56, 17p. 9 refs. NOTS-1616, Supersedes Technical memo. 276; AD-142 771.
Order from LC mi$2.40, ph$3.30 PB 137 508

This report, in conjunction with NOTS 1615, establishes a Test Department standard practice for range party-line communication systems in order to insure interchangeability of instruments among the several ranges. The standard practice establishes a sending audio-voltage-level equivalent to plus 4 VU on 600 ohms, a maximum line-audio-voltage ratio of 3:1, a maximum receiver-voltage sensitivity equivalent to minus 8 VU on 600 ohms, and a receiver input impedance of 10,000 ohms minimum. Also discussed are security of range-communication systems, joint use of poles and ducts, remote-control signaling, and auxiliary equipment.

Naval Research Lab., Washington, D. C.
DESIGN EVALUATION OF AN/CRC-7 EQUIPMENT, by L. M. Wrye and C. L. Uniacke. Dec 46, 31p. 3 refs. Rept. no. R-3027.
Order from LC mi$3.00, ph$6.30 PB 132 992

This report covers the results of the engineering performance analysis of two model AN/CRC-7 sea-rescue emergency radio transmitter-receivers, manufactured by the Sentinel Radio Company.

Naval Research Lab., Washington, D. C.
INVESTIGATION OF A CENTRALIZED COMBAT INFORMATION CENTER COMMUNICATION UNIT, GUIDED RADIO CORPORATION-MANUFACTURER, by W. W. Rosenberry and H. G. Shafer. 15 Dec 46, declassified 15 Dec 53. 42p. 4 refs. Rept. B-3017.
Order from LC mi$3.30, ph$7.80 PB 132 995

A special telephone communication unit, designed for shipboard installation in the Combat Information Center, has been investigated and evaluated for conformance to original design and suitability for use in the Service. This communication control unit is built around a master control panel intended for use by the commanding officer in a CIC room, or by an assistant who is interested in monitoring or talking into any of the various independent radio channels and battle telephone circuits that enters the CIC room.

Naval Research Lab., Washington, D. C.
PRECONVERSION OF OXIDE CATHODES, by G. A. Haas and J. T. Jensen, Jr. 25 Mar 59, 11p. 22 refs. NRL rept. 5275.
Order from OTS $0.50 PB 151 442

A study of gas evolution as a function of temperature has shown that the organic contaminants released during the carbonate and binder decomposition of a standard oxide cathode can be eliminated if the cathode is preconverted in a separate envelope and is then transferred to the final tube as the alkaline earth hydroxide. The technique used in accomplishing this and its application to thermionic and secondary emission studies are described. The results indicate a definite reduction of the contamination of tube components and show improved cathode characteristics.

Naval Research Lab., Washington, D. C.
TECHNICAL EVALUATION OF MODEL AN/APA-48 AIRBORNE RADIO DIRECTION FINDER, by Samuel M. Rice. Feb 47, 51p. 3 refs. Rept. no. R-3055.
Order from LC mi$3.60, ph$9.30 PB 133 000

The Radiomarine Corporation of America production model of the AN/APA-48 Airborne Radio Direction Finder equipment, designed for homing on radar signals in the frequency range from 125 to 190 megacycles and for use on the F6F aircraft, was evaluated to determine its compliance with the contract specifications.

Naval Research Lab., Washington, D. C.
THEORETICAL DESIGN OF PRIMARY AND SECONDARY CELLS. PART II. EFFECT OF POLARIZATION AND INTERNAL RESISTANCE ON CELL CHARACTERISTICS AND CELL DESIGN, by Clarence M. Shepherd. 30 Dec 58, 30p. 1 ref. NRL rept. 5212.
Order from OTS $0.75 PB 151 057

An uneven current density distribution in a battery may have a large number of undesirable effects on its characteristics, particularly at high current densities. This distribution is a function of the dimensionless factor VH, where H is the electrode height and V is the square root of the ratio of the grid resistance to the electrolyte resistance. The factor VH is also related mathematically to E, the potential drop when a load is applied to the battery. The problems of optimum cell design are discussed which involve these and other factors.

Navy Electronics Lab., San Diego, Calif.
A BROADBAND DISCONE/CAGE ANTENNA FOR 5-30 MC, by R. T. Brackett and W. E. Schaefer. 30 Dec 58, 11p. 5 refs. NEL/Rept. 882.
Order from LC mi$2.40, ph$3.30 PB 139 942

A composite, self-supporting structure adapted to double excitation in the frequency range 5-30 Mc was developed for use near a ship's bow or stern, where good omnidirectional characteristics can be expected at high frequencies. Model studies leading to the present configuration of the discone/cage antenna are covered, and the results of prototype studies are presented and explained.

New York U. Coll. of Engineering, N. Y.
EVALUATION AND OPTIMIZATION OF DIGITAL COMMUNICATION SYSTEMS, by S. S. L. Chang, B. Harris and others. Summary scientific rept. for 15 Jan-15 June 58 on Contract AF 19(604)1964. [1958] 100p. 37 refs. AFCRC TN-58-363; AD-160 807.
Order from LC mi$5.40, ph$15.30 PB 138 488

The work under this contract on the evaluation and comparison of digital communication systems is summarized, and a number of suggestions presented for improving the performance of such systems in the presence of interference and propagation anomalies. In particular, the theories of null-zone reception and communication feedback are emphasized, and certain coding concepts are considered. A critical review of work to date is included, and a number of promising areas for future investigation are outlined.

New York U. Coll. of Engineering, N. Y.
INVESTIGATION, STUDIES AND EVALUATION OF PERFORMANCE OF CRYSTAL UNIT CHARACTERISTICS, by Don J. R. Stock, L. Silver, and A. Yevlove. Quarterly progress rept. no. 2, 30 Nov 51-29 Feb 52, on Contract DA 36-039-sc-5493. [1952] 39p. 2 refs.
Order from LC mi$3.00, ph$6.30 PB 140 076

This report covers the data on the 1, 7, 9 and 13 mc crystals. New methods of handling the data are presented, and the small-sample theory of statistics is used in obtaining confidence limits on the resistance parameter.

New York U. Coll. of Engineering, N. Y.
INVESTIGATION, STUDIES AND EVALUATION OF PERFORMANCE OF CRYSTAL UNIT CHARACTERISTICS, by Don J. R. Stock, L. Silver and others. Quarterly progress rept. no. 3, 1 Mar-29 May 52, on Contract DA 36-039-sc-5493. [1952] 37p. 2 refs.
Order from LC mi$3.00, ph$6.30 PB 140 074

A Foreword contains basic definitions of quantities used in the report. Part I covers theoretical work done on the subject of change in resonant frequency of crystal units as a function of power. Part II contains a presentation of calculations made on particular crystals, using the work of Part I, as well as a discussion of the significance of these calculations. Part III contains a discussion of the measurement on the groups of crystals included in this report. Part IV mentions work done on the frequency divider unit.

New York U. Coll. of Engineering, N. Y.
INVESTIGATION, STUDIES AND EVALUATION OF PERFORMANCE OF CRYSTAL UNIT CHARACTERISTICS, by L. Silver, E. Strongin, and A. Yevlove. Quarterly progress rept. no. 4, 1 June-15 Sep 52, on Contract DA 36-039-sc-5493. [1952] 83p. 10 refs.
Order from LC mi$4.80, ph$13.80 PB 140 073

This report is divided into four major sections. The first section includes the history of the contract, a discussion of the method of measurement, and the equipment employed. Derivations of pertinent equations are included. The second section contains a summary of results obtained from measurements made on crystal units. The third section sets forth the results of a theoretical study of a typical crystal oscillator circuit on a class A basis. Equations are derived which must be satisfied in design of an oscillator for greatest frequency stability. This study also determines the necessary crystal parameters required. Part four contains conclusions based upon the work of the project, together with recommendations for future study. The objectives of the contract are discussed. (See also PB 140 074)

New York U. Coll. of Engineering, N. Y.
INVESTIGATION, STUDIES, AND EVALUATION OF

ERFORMANCE OF CRYSTAL UNIT CHARACTER-STICS. TASK A: INVESTIGATION AND STUDIES F MICROWAVE FREQUENCY DIVISION, by avid Cohen and L. Silver. Quarterly progress rept. o. 5, 15 Sep-15 Dec 52 on Contract DA 36-039-sc-493. [1952] 26p. 31 refs.
Order from LC mi$2.70, ph$4.80 PB 140 067

historical development of frequency division is resented together with the basic philosophy of a requency divider. Methods and practices in common se are outlined with specific examples. Application f the techniques used at low frequencies to the micro-ave region are discussed. The advantages and daptabilities of the various systems are specified nd a bibliography of pertinent references is resented. (See also PB 140 073)

Office of Scientific Research and Development. Div. 6.
ESIGN AND CONSTRUCTION OF CRYSTAL RANSDUCERS, ed. by F. N. D. Kurie (Columbia U.). ummary Technical Rept. Vol. 12, on Contract EMsr-1131. 1946, declassified 23 Apr 58, 406p. 9 refs. AD-200 790.
Order from LC mi$11.10, ph$62.10 PB 139 777

Contents:
eneral survey, by Glen D. Camp
he phenomenological theories of linear dissipative electrics, dielectrics, and piezoelectrics, by Glen D. Camp
roperties of the component parts of crystal transducers, by Richard Bellman, T. Finley Burke, Glen D. Camp, Bourne G. Eaton, and Fred M. Uber
roperties of assembled crystal transducers, by T. Finley Burke, Glen D. Camp, and Bourne G. Eaton
lectronic systems and matching networks, by Francis X. Byrnes
esign procedures, by T. Finley Burke
esign adjustment, by T. Finley Burke
onstruction techniques and equipment, by Fred M. Uber
esearch techniques and apparatus, by T. Finley Burke, Francis X. Byrnes, and Bourne G. Eaton

Ohio State U. Research Foundation, Columbus.
STUDY OF PARAMETRIC AMPLIFICATION, by E. E. Bell and Y. P. Vaddiparty. Scientific rept. no. 1 on Contract AF 19(604)4060. Nov 58, 25p. 7 refs. AFCRC-TN-59-133; AD-210 496.
Order from LC mi$2.70, ph$4.80 PB 140 143

arametric amplifiers employing semiconductor junction diodes as non-linear capacitors have been studied heoretically and experimentally. The theoretical nalysis is based upon the principle of harmonic balance and leads to rapidly convergent series representations for the important circuit variables. This pproach has the advantage of simplicity of application nd is probably a more reasonable approximation to he actual physical situation than the conventional alculation based upon Mathieu's or Hill's equation. arametric amplifiers were constructed at frequencies f 13 kc and 1.14 Mc in order to check the theoretical alculations. A bridge circuit was used in some instances to provide improved isolation of the signal and umping circuits.

Pacific Semiconductors, Inc., Culver City, Calif.
INTRINSIC-BARRIER TRANSISTOR TECHNIQUES (SILICON), by J. L. Buie. Quarterly rept. no. 4 15 Apr-15 July 58, on Contract DA 36-039-sc-74887. [1958] 47p. 7 refs. PSI rept. no. 3000:15-13-Q.
Order from LC mi$3.30, ph$7.80 PB 138 833

More advanced designs have been fabricated which exhibit better gain and power output. Presents comparative design data, transistor fabrication, and transistor terminal characteristics.

Palmer Physical Lab., Princeton U., N. J.
INVESTIGATION INTO REDUCTION OF DOPPLER WIDTH OF MICROWAVE ABSORPTION LINES, by George S. Newell. Quarterly rept. no. 2 for 1 July-30 Sep 51 on Contract DA 36-039-sc-5541. [1951] 13p.
Order from LC mi$2.40, ph$3.30 PB 140 066

This report summarizes the present status of construction, and presents an analysis of proposed receiver systems.

Pickard and Burns, Inc., Needham, Mass.
NAVARHO EVALUATION, ADDENDUM. BOOK I. Rept. for 1 June-30 Aug 57 on Contract AF 30(635)4487. 11 Apr 58, 113p. P & B pub no. 462; RADC TN-58-142A; AD-148 743.
Order from LC mi$6.00, ph$18.30 PB 135 703

This Addendum Report on the Navarho Evaluation presents additional data describing the system performance of the Navarho long distance navigation system.

Purdue U. School of Electrical Engineering, Lafayette, Ind.
NONLINEAR DIFFERENTIATING FILTERS, by George R. Cooper and Jack E. Kemmerly. Final technical rept. for Feb 1 56-5 May 58 on Contract AF 18(600)1588. [1958] 85p. 10 refs. AFOSR TR-58-86; AD-162 106.
Order from LC mi$4.80, ph$13.80 PB 137 675

An unconventional method of differentiating a non-stationary electrical signal in the presence of noise is described. The input to a certain passive electrical network is assumed to consist of a signal voltage, having a finite discontinuity at zero time, mixed with a perturbing noise voltage. The electrical network is then to serve the dual purpose of filtering out as much of the noise as possible, and providing in its output the exact value of the time derivative of the input signal in the shortest possible time. In this sense, then, the network shall be called a "differentiating filter".

Radiation Effects Information Center, Battelle Memorial Inst., Columbus, Ohio.
THE EFFECT OF NUCLEAR RADIATION ON ELECTRONIC COMPONENTS AND SYSTEMS, by J. F. Hansen, S. E. Harrison, and W. L. Hood. Rept. on Contract AF 33(616)5171. 31 Dec 57, 24p. 1 ref. REIC rept. no. 2; AD-149 551.
Order from LC mi$2.70, ph$4.80 PB 140 357

Resistors in general will function satisfactorily after doses of 10^{18} nvt, wire-wound resistors being by far the most radiation resistant. Mica, glass, and ceramic capacitors suffer little damage when exposed to doses of 10^{18} nvt, but plastic, electrolytic, and oil-filled or oil-impregnated capacitors are extremely susceptible to radiation. Tubes, in general, are usable in radiation fields. One of the largest causes of tube failures is envelope and seal fractures caused by the use of borosilicate glasses. Insulators show a decrease in insulation resistance after prolonged exposure and show lower insulating value in the radiation field. Semiconductor devices reach the end of their useful life at doses of about 10^{13} nvt.

Reeves-Hoffman Div., Carlisle, Pa.
DEVELOPMENT OF HIGH TEMPERATURE FUNDAMENTAL MODE AT CUT CRYSTAL UNITS, by Charles W. Mann. Quarterly rept. no. 1, 28 May-Sep 56, on Contract DA 36-039-sc-72405. [1956] 50p.
Order from LC mi$3.30, ph$7.80 PB 140 138

The work consists of setting up equipment to facilitate testing from -60° to 135°C, testing of CR-19/U units, and preliminary investigation of the correct cutting angle for crystal units operating at 125°C.

Reeves-Hoffman Div., Carlisle, Pa.
DEVELOPMENT OF HIGH TEMPERATURE FUNDAMENTAL MODE AT CUT CRYSTAL UNITS, by Charles W. Mann. Quarterly rept. no. 2, 1 Sep-30 Nov 56, on Contract DA 36-039-sc-72405. [1956] 48p.
Order from LC mi$3.30, ph$7.80 PB 140 136

Most of the CR-19/U crystal units meet aging requirements. Four new frequencies are being processed with new cutting angles to establish a cutting angle vs frequency curve. (See also PB 140 138)

Reeves-Hoffman Div., Carlisle, Pa.
DEVELOPMENT OF HIGH TEMPERATURE FUNDAMENTAL MODE AT CUT CRYSTAL UNITS, by Charles W. Mann. Quarterly rept. no. 3, 1 Dec 56-28 Feb 57, on Contract DA 36-039-sc-72405. [1956] 66p.
Order from LC $3.90, ph$10.80 PB 140 137

Units processed with monolayer metal electrodes gave the best aging results. Before this low aging characteristic can be realized a plating system will have to be developed which simultaneously applies the electrodes and adjusts the crystal units to finish frequency. All of the materials and techniques checked could be used to produce crystal units in the 1000 to 3000 Kc. range that would operate for 42 days at 125°C and age less than ±.001% with a good margin of safety. (See also PB 140 136)

Reeves-Hoffman Div., Carlisle, Pa.
DEVELOPMENT OF HIGH TEMPERATURE FUNDAMENTAL MODE AT CUT CRYSTAL UNITS, by Charles W. Mann and Ernest F. Schneider. Quarterly rept. no. 4, 1 Mar-31 May 57 on Contract DA 36-039-sc-72405. [1957] 34p. AD-139 192.
Order from LC mi$3.00, ph$6.30 PB 140 135

With the proper cutting angles a zero temperature coefficient is obtained in the vicinity of 125°C. Shock, vibration and leakage tests were performed according to contract specifications and all units passed.

Reeves-Hoffman Div., Carlisle, Pa.
DEVELOPMENT OF HIGH TEMPERATURE FUNDAMENTAL MODE AT CUT CRYSTAL UNITS, by Charles W. Mann and Ernest F. Schneider. Quarterly rept. no. 5, 1 June-31 Aug 57, on Contract DA 36-039-sc-72405. [1957] 31p.
Order from LC mi$3.00, ph$6.30 PB 140 128

To condense the 42 day aging period into a shorter time, processes tried were, thermal shock, high frequency vibration and high drive. None of the processes were successful.

Reeves-Hoffman Div., Carlisle, Pa.
DEVELOPMENT OF HIGH TEMPERATURE FUNDAMENTAL MODE AT CUT CRYSTAL UNITS, by Charles W. Mann and Ernest F. Schneider. Quarterly rept. no. 6, 1 Sep-30 Nov 57, on Contract DA 36-039-sc-72405. [1957] 29p.
Order from LC mi$2.70, ph$4.80 PB 140 127

800 Kc. and 5 Mc. units are being reprocessed with new contours (bevel) in order to reduce the spurious responses. Frequency and activity over the temperature range during the 42 day aging period are given for the 10 and 15 Mc. units. (See also PB 140 128)

Reeves-Hoffman Div., Carlisle, Pa.
DEVELOPMENT OF HIGH TEMPERATURE FUNDAMENTAL MODE AT CUT CRYSTAL UNITS, by Charles W. Mann and Ernest F. Schneider. Final rept. for 28 May 56-28 Feb 58 on Contract DA 36-039-sc-72405. [1956] 98p.
Order from mi$5.40, ph$15.30 PB 140 126

CR-19/U units were tested over the range -60 to 135°C and aged for 74 days. Frequencies checked were 1399.820 Kc., 1750 Kc., and 2500 Kc. Sample units ranging from 800 Kc. to 15 Mc. were fabricated with contouring procedures worked out for each frequency. (See also PB 140 127)

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
QUARTERLY PROGRESS REPT. NO. 47 FOR PERIOD ENDING 31 AUGUST 1957, by J. B. Wiesner, G. G. Harvey, and H. J. Zimmermann. Rept. on Contract DA 36-039-sc-64637. 15 Oct 57, 147p. 64 refs. AD-148 237.
Order from LC mi$7.20, ph$22.80 PB 138 952

Contents:
Physical electronics
Microwave gaseous discharges
Solid state physics
Microwave spectroscopy
Nuclear magnetic resonance and hyperfine structure
Microwave electronics

Atomic beams
Frequency modulation
Statistical communication theory
Process analysis and synthesis
Statistical thermodynamics
Transistor and diode studies
Circuit theory
Network synthesis
Microwave theory
Neurophysiology

Rome Air Development Center, Griffiss AFB, N. Y.
DESIGN OF TRANSPORTABLE TACAN FACILITY, AN/TRN-6, by Donald Fehr. Dec 57, 32p.
RADC TR-57-137; AD-131 225.
Order from LC mi$3.00, ph$6.30 PB 134 983

Development work needed to integrate Radio Set AN/URN-3 and associated antenna group into a transportable TACAN system is described. Work was performed by Craig Machine, Inc. according to RADC specifications. Engineering studies and packaging techniques necessary to provide a facility, capable of being transported by a government standard four-ton, six by six cargo truck with a 12-foot body or by a C-119 aircraft are traced from initial engineering model up to final model, the AN/TRN-6. An existing shelter was modified to provide (1) sufficient space for radio equipment and operating personnel, (2) adequate ventilation and air conditioning within the shelter, (3) a lifting-arm mechanism mounted upon the shelter exterior, capable of supporting the antenna group during storage and elevating it into position during use. A two-wheel trailer unit, mounting a diesel-driven electric generator and air conditioner, was fabricated for use in servicing the shelter. The trailer also provides storage space for tools and shelter lifting device.

Rome Air Development Center, Griffiss AFB, N. Y.
MOBILE INTERFERENCE MEASUREMENTS LABORATORY, by Robert Powers. Mar 59, 15p. RADC-TN-59-36; AD-210 115.
Order from LC mi$2.40, ph$3.30 PB 140 021

A mobile interference measurements laboratory was developed for use in the Interference and Antijamming Analysis and Control Branch, Advanced Development Laboratory. This van is composed of two compartments, a personnel quarters and a laboratory work area. The laboratory part of the van is in essence a double-walled screen room, each wall isolated from the other having an overall attenuation of 60 to 70 db throughout the frequency range of 150 kilocycles per second to 10,000 megacycles per second.

Rome Air Development Center, Griffiss AFB, N. Y.
SYMPOSIUM: MILITARY ELECTRONICS RELIABILITY AND MAINTAINABILITY. VOL. 1. RELIABILITY SPECIFICATIONS AND TESTING TECHNIQUES. Nov 58, 78p. 11 refs. RADC-TR-58-139A; AD-148 951
Order from LC mi$4.50, ph$12.30 PB 140 078

Management looks at the military requirements for reliability and maintainability
Can we face the challenge of the life test
The approach to reliability via MIL-C-26244
The confidence that can be placed in various reliability test
An integrated reliability program for complex systems development

Rome Air Development Center, Griffiss AFB, N. Y.
SYMPOSIUM: MILITARY ELECTRONICS RELIABILITY AND MAINTAINABILITY VOL. 2. PREDICTION AND ANALYSIS OF EQUIPMENT RELIABILITY, Nov 58, 73p. 53 refs. RADC-TR-58-139B; AD-148 952
Order from LC mi$4.50, ph$12.30 PB 140 079

Contents:
The RADC reliability prediction and measurement study
A clarification of some mathematical concepts misused in reliability analysis
A reliability factor model and its implications re the relations between reliability, maintainability, and quality control
A comparison of measured and predicted reliability data
(See also PB 140 078)

Rome Air Development Center, Griffiss AFB, N. Y.
SYMPOSIUM: MILITARY ELECTRONICS RELIABILITY AND MAINTAINABILITY. VOL. 3. RELIABILITY IMPROVEMENT. Nov 58, 74p. RADC-TR-58-139C; AD-148 953.
Order from LC mi$4.50, ph$12.30 PB 140 080

Contents:
Preliminary planning for optimized thermal design for forced air cooling
Reliability through redundancy
Use of malfunction data at base level
Cooling techniques for equipment reliability
Reliability of parallel electronic components
(See also PB 140 079)

Rome Air Development Center, Griffiss AFB, N. Y.
SYMPOSIUM: MILITARY ELECTRONICS RELIABILITY AND MAINTAINABILITY. VOL. 4. TECHNIQUES FOR QUANTIFYING AND IMPROVING MAINTAINABILITY. Nov 58, 72p. 9 refs. RADC-TR-58-139D; AD-148 954.
Order from LC mi$4.50, ph$12.30 PB 140 081

Contents:
The bureau of ships maintainability program
Quantification of equipment maintainability
Practicability of throw-away maintenance
Measurement and prediction of equipment maintainability
A study of automatic testing of electronic equipment
Maintainability or effective combat readiness
(See also PB 141 080)

Rome Air Development Center, Griffiss AFB, N. Y.
TROPOSPHERIC REFRACTION EFFECTS ON HEIGHT-FINDING RADARS, by By Byron Bailin and Lawrence Colin. Feb 59, 47p. 12 refs. RADC TN-59-1; AD-208 284.
Order from LC mi$3.30, ph$7.80 PB 139 950

Radar systems of today are simultaneously achieving increased range and accuracy capabilities. This has led to requirements for more accurate corrections for atmospheric refraction than is provided for by the four-thirds earth's radius approximation. The prime purpose of this report is to survey the state-of-the-art of refraction problems and to indicate specific correction procedures as related to height finding radars.

Rome Air Development Center, Griffiss AFB, N. Y.
THE USAF ANTENNA PROVING RANGE, by Charles L. Pankiewicz. Apr 59, 22p. 2 refs. RADC-TN-59-98; AD-212 019.
Order from LC mi$2.70, ph$4.80 PB 140 022

This is an interim report describing the present status of the construction, instrumentation, and proposed operation of the USAF Antenna Proving Range established at Newport, New York. The range was previously reported in RADC-TR-52-18, September 1952. A more complete description of techniques is given in this report for solving the technical problems involved; this report also discusses outfitting the site with suitable equipment so that antenna measurements can be quickly and easily determined, and thus there will be released prototype antenna designs for production and subsequent field use.

Scientific Radio Products, Inc., Omaha, Nebr.
GLASS ENCLOSED QUARTZ CRYSTAL UNITS, by Jack L. Saunders and Donald L. Hammond. Quarterly rept. no. 1, 15 Feb-15 May 58, on Contract DA 36-039-sc-74999. July 58, 17p. 2 refs.
Order from LC mi$2.40, ph$3.30 PB 139 824

Problems and results in the fabrication of moderate precision crystal units for enclosure in the HC-6/U glass configuration are presented. Complete design parameters are given for all of the required frequencies. Difficulties in the installation of the glass sealing machine and mechanical failures encountered are described. Methods and techniques utilized in aging measurements are presented in an effort to obtain repeatabilities greater than one part in 10^8.

Shoup Engineering Co., Chicago, Ill.
BROADBAND RECORDING EQUIPMENT, by Allen Shoup, Jack C. Smeltzer and others. Final rept. for 1 Mar 53-20 May 54 on Contract DA 36-039-sc-42683. [1954] 49p.
Order from LC mi$3.30, ph$7.80 PB 140 064

The purpose of this work was to develop and construct an engineering model of a Broadband Recording and Reproducing equipment with a frequency range of 1 cps to 5 mc using magnetic tape as the medium. The work was divided into two Phases --- Phase I involved an analysis of the problem, and investigation of various approaches on the basis of theoretical and basic principles of Broadband recording equipment. Phase II involved the design and construction of an engineering model Broadband Recording equipment based on the theoretical findings and considering the practical limitations and presently known techniques. This report treats the efforts accomplished by the Shoup Engineering Co. for a period of fourteen months. The results of the work show to a large extent that a Broadband Recorder of the type described herein is feasible and that with additional effort to modify and test the experimental machine which was constructed a practical unit can be achieved.

Stanford Electronics Lab., Stanford U., Calif.
A STUDY OF AVALANCHE TRANSISTORS, by D. S. Gage. Technical rept. no. 36 on Contract Nonr 225(24). 13 June 58, 132p. 17 refs.
Order from LC mi$6.90, ph$21.30 PB 140 108

In this study of avalanche transistors the simultaneous occurrence of avalanche multiplication and voltage punch through was discovered to produce either large current pulses or pulses with a very fast rise time. As examples, circuits are given in which small transistors with performance ordinarily limited to low frequencies (1) carry a current pulse of 18 amperes or (2) operate with a rise time of 4×10^{-9} sec. An analysis of this mode of operation is given which includes some quantitative results and a description of the regenerative mechanism.

Stanford Electronics Labs., Stanford U., Calif.
A TRANSISTORIZED LINEAR SWEEP CIRCUIT, by E. F. Yhap. Technical rept. no. 38 on Contract Nonr-225(24). 5 June 58, 62p. 8 refs.
Order from LC mi$3.90, ph$10.80 PB 139 848

The purpose of this report is the study of a linear sweep generator composed of a triggered gate generator and a bootstrap circuit, with particular attention paid to the linearity of the sweep generator output voltage and to the effects of temperature on the gate generator. For this application germanium junction transistors can be satisfactorily used over a temperature range of sixty or seventy degrees Centigrade, provided care is taken in the design of the circuit. The heart of the sweep generator lies in a bootstrap type of circuit, which requires an amplifier with high input impedance and close to unity amplification. A novel way of combining two transistors to meet these requirements is introduced. The constant-current pair, as it will be called, is compared to the Darlington pair, and it is shown that the former presents definite advantages in this application. A solution is presented for the recovery-time problem common to bootstrap circuits. This solution does not require any additional transistors or circuit elements.

Stanford Research Inst., Menlo Park, Calif.
FACTORS AFFECTING THE INFORMATION-HANDLING CAPABILITY OF A METEOR-BURST COMMUNICATION SYSTEM, by W. R. Vincent and R. A. Rach. Scientific rept. 8 on Contract AF 19(604)1517. June 58, 23p. 8 refs. AFCRC-TN-58-399; AD-160 858.
Order from LC mi$2.70, ph$4.80 PB 136 762

High-speed transmission during bursts has been generally accepted as the most efficient means of using the meteor-burst mode of communication. Preliminary field measurements in the lower VHF region indicate that there is no single most efficient transmission rate, but that the rate may have to be adjusted with time of day. Increasing the information rates during

bursts raises the minimum usable signal-to-noise ratio, and results in less frequent and shorter bursts. Hence, the average rate, which is the product of duty cycle and rate during bursts, may sometimes be increased by decreasing the rate during bursts. Studies and field experiments related to the most efficient transmission rates are discussed. Theoretical and experimental data on the relation between duty cycle and decision level are presented in some detail.

Stanford Research Inst., Menlo Park, Calif.
A METEOR-BURST VOICE COMMUNICATION SYSTEM, by Russell Wolfram. Scientific rept. 9 on Contract AF 19(604)1517. Aug 58, 33p. 1 ref. AD-160 836.
Order from LC mi$3.00, ph$6.30 PB 137 184

A VHF voice communication circuit using radio signals reflected from ionized meteor trails was established and operated for three weeks between Bozeman, Montana, and Palo Alto, California, a distance of 820 miles. This report discusses the design and operation of a voice communication system which detects these reflected signals and controls the flow of information from transmitter to receiver coincident with an acceptable signal level. The voice information was transmitted during meteor bursts at five times normal speed using single-sideband modulation. It was recorded and stored at the receiver and then played back at normal speed for listening or re-recording. The system was first developed and tested for teletype communication and then converted to voice communication. Conversion to voice communication required several new components, but most of the new components are quite similar to those used in standard communication circuits.

Stanford Research Inst., Menlo Park, Calif.
TELETYPE CAPACITY TESTS ON THE STANFORD-BOZEMAN METEOR-BURST COMMUNICATION SYSTEM, by W. R. Vincent, R. T. Wolfram and others. Scientific rept. 10 on Contract AF 19(604)1517. Jan 59, 19p. 2 refs. AFCRC-TN-59-132; AD-210 495.
Order from LC mi$2.40, ph$3.30 PB 140 146

System parameters for the Stanford-Bozeman meteor-burst communication system are presented. Using the system parameters described, a limited number of tests were conducted to measure the teletype capacity in words per minute. Data taken are shown and discussed. Some attempt is made to scale the data to systems using different parameters. The data presented in this report are in general agreement with the Canadian Janet results, when system and test differences are taken into account.

Stavid Engineering, Inc., Plainfield, N. J.
INVESTIGATION OF TECHNIQUES FOR DISPLAYING INFORMATION IN AN AIR TRAFFIC CONTROL CENTER, by Richard A. Barker. Final rept. on Contract AF 19(604)2034. May 58, 155p. 50 refs. AFCRC-TR-58-113; AD-146 829.
Order from LC mi$7.50, ph$24.30 PB 135 881

The important features of a variety of dynamic display equipments and techniques pertaining to air traffic control centers are described, broken down into (1) cathode-ray tube techniques, (2) optical techniques, and (3) special techniques. These equipments and devices are briefly analyzed from the standpoint of one or more of the following possible display applications: (1) large, bright, PPI-type displays, (2) color coded displays, (3) displays imparting altitude information, (4) tabular displays, and (5) miscellaneous displays. Significant advantages and disadvantages of these equipments and techniques are discussed.

Technical Operations, Inc., Burlington, Mass.
POWER TRANSISTOR CIRCUITRY, by Robert H. Packard. Final rept. on DA 36-039-sc-72361. 31 July 57, 60p. 2 refs. Rept. no. TOI-57-24; AD-146 478.
Order from LC mi$3.60, ph$9.30 PB 140 106

Extensive testing of the breadboards was carried out and improvements incorporated into final packaged units. Four power supplies have been placed on life test and are still in operation after periods of 2000 to 8000 hours. All three of the specified power supplies had multiple output voltage requirements ranging from 6V to 650 V. They all required regulation against line voltage variations, making it advisable to use saturable reactor type regulators to obtain the maximum over all efficiency. Elevated temperature requirements dicated proper attention to thermal design. Five packaged units have been constructed as practical examples of the designs that have been worked out. Extensive data on the three typical transistor power converters have been taken showing that they are indeed reliable, efficient, and rugged devices for obtaining multiple higher voltage DC outputs from lower DC inputs under adverse environmental conditions.

Transistor Applications, Inc., Boston, Mass.
THE STUDY, ANALYSIS AND DESIGN OF TRANSISTOR CIRCUITS. Scientific rept. no. 1 on Contract AF 19(604)4089. Dec 58, 25p. 5 refs. AFCRC-TN-58-590; AD-207 600
Order from LC mi$2.70, ph$4.80 PB 139 422

The investigation in Part I of this report is directed toward seeking a better understanding of the high current mode of operation of transistors, and to find possible circuit applications. Part II is concerned with the investigation of pulse generating circuits capable of producing pulses of extremely short duration. In one area of investigation, the Westinghouse Dynistor switching diode is used. Characteristics of this device are plotted dynamically and several circuits are shown. Delay line techniques utilizing the Dynistor are also discussed and presented as a method of producing short duration pulses.

Virginia Engineering Experiment Station, Blacksburg.
FINAL REPORT ON NAVY CONTRACT N383s-95917. Feb 55, 22p.
Order from LC mi$2.70, ph$4.80 PB 135 601

The objects were: to see how large a radome could be fabricated in the unfired state using body B77 and the development of surface coatings to improve strength and render the piece as a whole impervious.

Washington U., Seattle. Coll. of Engineering.
EXPERIMENTAL ANALYSIS OF THE SURFACE AND TIP EXCITATION OF A CONE BY A SLOT, by Gedalia Held and Gerard Hasserdjian. Technical rept. no. 25 on Contract AF 19(604)1381. March 58, 34p. 9 refs. AFCRC-TN-58-163; AD-152 399.
Order from LC mi$3.00, ph$6.30 PB 135 399

This report presents an experimental study of the excitation of the surface and the tip of a cone due to various slot sources located on its surface. The observations are based on experimental measurements of the field distribution on the cone surface. The experimental technique of making the surface field measurements is presented in detail.

Mechanical Engineering

Material Lab., New York Naval Shipyard, Brooklyn.
EVALUATION OF 8 INCH DIAMETER FLEXIBLE HOSE ASSEMBLIES. Final rept. 29 Aug 58, 39p. 9 refs. Lab. project 6002-1
Order from LC mi$3.00, ph$6.30 PB 137 429

Comparative performance evaluations were conducted by the Material Laboratory on flexible hose assemblies made by two manufacturers. It was found that the hose made by one manufacturer showed superior performance when subjected to evaluations for pressure loss in straight lengths, abrasion over a simulated hatch coaming, tensile strength and puncture resistance. Hose made by the other manufacturer showed superior performance when subjected to evaluations for pressure loss when formed into 90° and 180° bends, and for abrasion on a "CSI Surface Abrader".

Pennsylvania State U., University Park.
SCABBING IN BARS AND PLATES: FURTHER STUDIES, by Sudhir Kumar. Interim technical rept. no. 13 on Scabbing and Fracture of Materials by Stress Waves, Contract DA 36-061-ORD-465. 1 Mar 58, 19p. 12 refs. AD-137 063.
Order from LC mi$2.40, ph$3.30 PB 135 475

Scabbing is a fracture phenomenon in materials, due to stress reversal of strong dynamic loads. An elastic analysis for determining scab lengths both in bars and plates under plane stress and plane strain is presented. Stress-strain relations for 14ST-4 Aluminum have been used.

Ordnance, Missiles, and Satellite Vehicles

Aero Medical Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
EQUIPMENT MAINTENANCE WITH VARIOUS NUMBERS OF SERVICE MEN: A SIMPLE ANALYSIS, by George O. Wright, Richard L. Deininger and others. Rept. on Human Engineering Analysis of Weapons Systems. Nov 58, 42p. WADC Technical rept. 58-543; AD-206 291.
Order from OTS $1.25 PB 151 683

A simple analysis of a maintenance problem is made in terms of the Markov Process, a form of probability theory. The problem involves a piece of equipment and a group of maintenance men. The question is whether to leave the equipment alone, to have one man service it, or to have a series of more than one man service it. The simplest case considers only one type of equipment and only one type of maintenance man. The decision whether to use zero, one, or more than one man depends on the initial condition of the equipment as well as on the skills of the men. The analysis specifies the conditions under which it is wise to leave the equipment untouched, to use only one man, or to use as many men as are available. Moreover, the analysis shows that the operation of the equipment ultimately depends on the skills of the men rather than its initial condition. Several more complicated cases are considered briefly.

Air Crew Equipment Lab. Naval Air Material Center, Philadelphia, Pa.
ENVIRONMENTAL REQUIREMENTS OF SEALED CABINS FOR SPACE AND ORBITAL FLIGHTS. PART 1. INTRODUCTION TO A CONFINEMENT EXPERIMENT AND DESCRIPTION OF THE TEST CHAMBER, by E. Hendler and D. A. Mancinelli. 27 Aug 58, 13p. NAMC-ACEL-383.
Order from LC mi$2.40, ph$3.30 PB 139 792

An introduction is given to a four-part report on a confinement experiment in which six men were isolated for seven days in a chamber of limited space and facilities breathing a high concentration of oxygen. A description of the test chamber is given.

Air Crew Equipment Lab., Naval Air Material Center, Philadelphia, Pa.
ENVIRONMENTAL REQUIREMENTS OF SEALED CABINS FOR SPACE AND ORBITAL FLIGHTS. PART 2. CONTINUOUS EXPOSURE OF HUMAN SUBJECTS TO INCREASED OXYGEN TENSION FOR SEVEN DAYS, by E. L. Michel and R. W. Langevin. 10 Sep 58, 16p. 12 refs. NAMC-ACEL-384.
Order from LC mi$2.40, ph$3.30 PB 139 729

Six volunteers were confined for a seven-day period (168 hrs.) in an altitude chamber at 10,000 feet (523 mm Hq) simulated altitude breathing 80 per cent oxygen. This confinement was without marked effect on the general appearance, activity, and physical well being of the subjects. However, signs of pulmonary irritation indicated that the permissible human limitation for prolonged exposure to a higher than normal oxygen concentration may have been approached. (See also PB 139 792)

Air Crew Equipment Lab., Naval Air Material Center, Philadelphia, Pa.
ENVIRONMENTAL REQUIREMENTS OF SEALED CABINS FOR SPACE AND ORBITAL FLIGHTS. PART 3. PERFORMANCE AND HABITABILITY ASPECTS OF EXTENDED CONFINEMENT, by John Gaito, Thomas D. Hanna and others. 26 Sep 58, 57p.

9 refs. NAMC-ACEL-385.
Order from LC mi$3.60, ph$9.30 PB 139 728

This study was concerned with the effects on the behavior of six men during seven days of confinement in a small area in which an oxygen concentration equivalent to 55 per cent at sea level was present. The results indicated that it was safe to conclude that the intellectual and psychomotor functions of subjects should not deteriorate over seven days even though the physical conditions were not optimum.
(See also PB 139 729)

Air Crew Equipment Lab., Naval Air Material Center, Philadelphia, Pa.
ENVIRONMENTAL REQUIREMENTS OF SEALED CABINS FOR SPACE AND ORBITAL FLIGHTS, PART 4. PHYSIOLOGICAL CHANGES PRODUCED IN HUMANS BY PROLONGED CONFINEMENT IN AN OXYGEN-RICH ENVIRONMENT, by L. M. Libber, L. J. SantaMaria, and P. R. Tiller, Jr. 8 Oct 58, 15p. 10 refs. NAMC-ACEL-386.
Order from LC mi$2.40, ph$3.30 PB 139 734

Six men, confined for one week to limited quarters, eating Army "C" rations and breathing 80% oxygen at 10,000 feet simulated altitude, showed no severe stress in spite of decreased appetite and food intake resulting in moderate body weight loss. (See also PB 139 728)

Air Force Cambridge Research Center, Bedford, Mass.
BEHAVIOR OF ATMOSPHERIC DENSITY PROFILES, by Norman Sissenwine, William S. Ripley, and Allen E. Cole. Dec 58, 96p. 14 refs. Air Force Surveys in Geophysics no. 109; AFCRC-TN-58-627; AD-160 755.
Order from LC mi$5.40, ph$15.30 PB 139 424

A statistical method of estimating the variation in range of free-falling bombs or missiles due to atmospheric density variations is presented. Arrays of means and standard deviations of density by 2-km intervals of altitude up to 28 km and coefficients of correlations between levels are provided for the required calculations. An example of determination of the density contribution to the "Circular Error Probable" (the variability in range exceeded 50 percent of the time) is provided. Graphs are also presented which indicate some atmospheric density relationships of interest to the meteorologist as well as to the designer.

Air Force Cambridge Research Center, Bedford, Mass.
AN INTERESTING PROPAGATION EFFECT OF SPUTNIK I, by Edmond Dewan. Dec 58, 24p. AFCRC-TR-58-354; AD-160 760.
Order from LC mi$2.70, ph$4.80 PB 140 159

Using four 20-Mcps interferometers, the AFCRC Electromagnetic Radiation Laboratory obtained data on 35 Sputnik I passes during a period of 14 days in October 1957. A study of the data revealed anomalously peaked intensities in the signal on 4 successive days: when the satellite was between 730 and 2000 miles from the receiver the intensity of the signal was occasionally as great as the signal received during the direct overhead pass. A theoretical model explaining the phenomenon and all its peculiarities is proposed on the basis of a quantitative analysis of both Brush recordings and the recorded audiofrequencies.

Air Force Cambridge Research Center, Bedford, Mass.
TRACKING OF A MOVING TRANSMITTER BY THE DOPPLER EFFECT, by Thomas Skinner. Dec 58, 23p. 1 ref. AFCRC-TR-58-364; AD-208 699.
Order from LC mi$2.70, ph$4.80 PB 139 909

This report considers the feasibility of tracking a moving transmitter (in particular, an artificial earth satellite) by measurements of doppler shift only. Although it is shown to be possible to track a transmitter moving on an arbitrary course, unless sufficient a priori knowledge of the motion is available the experimental and computational procedures are impractically involved. With this in mind two restricted types of motion are considered, --constant velocity and two-body central field motion. The former is analytically very simple, and the latter is a reasonable approximation to the motion of an artificial satellite.

Air Force Missile Development Center, Holloman AFB, N. Mex.
CHARTS TO DETERMINE THE VISIBILITY OF ARTIFICIAL SATELLITES, by Paul D. Jose (U. of Michigan) and Marcellus Duffy. Apr 59, 33p. AFMDC-TR-59-10; AD-211 477.
Order from LC mi$3.00, ph$6.30 PB 140 051

Curves are presented which show the height of the earth's shadow cone above the horizon plane in the vicinity of the observer for altitudes of the sun from -5^{o} to -50^{o}.

Air Force Missile Development Center, Holloman AFB, N. Mex.
DESCRIPTION OF AFMDC PROTOTYPE CAMERA STATION FOR SATELLITE SURVEILLANCE, by Walter E. Woehl and Richard M. Waetjen. Rept. on Project Space Track. Mar 59, 47p. 5 refs. AFMDC-TR-59-3; AD-209 327.
Order from LC mi$3.30, ph$7.80 PB 140 139

The basic requirements and a description of the philosophy adopted in the determination of accurate orbital data of satellites with the help of ballistic cameras are given. Coded automatic-shutter operation and correlation to true standard time are described, and the photometric performance of the cameras using different optics is computed. Data processing and evaluation, and improvements in the basic system are outlined. Sample photos of recordings are included along with a summary of those satellite position determinations which were performed.

Allied Research Associates, Inc., Boston, Mass.
LAUNCHING OF AIRBORNE MISSILES UNDERWATER. PART I. RESPONSE OF A STABLE MISSILE TO A STORMY SEA, by Theodore R. Goodman

and Eugene L. Krasnoff. Rept. on Contracn Nonr-2343(00). June 58, 51p 14 refs. Document no. ARA-467.
Order from LC mi$3.60, ph$9.30 PB 139 965

The technique of generalized harmonic analysis is employed to evaluate the responses of a slender, fin-stabilized missile moving in a vertical trajectory towards the free surfacr of a turbulent sea. The forward speed of the missile is considered constant, and use is made of the theoretical energy spectrum of Neumann to describe (probabalistically) the field of turbulence through which the missile is traveling. General expressions for rms (root-mean-square) trajectory response parameters are obtained, and these are shown to be valid for a wide range of missile speeds, sea states, and launch depts. An approximate computation for a simple missile configuration is then performed, and it is found that the trajectory responses are small. In particular, the rms deflection from the vertical trajectory reaches a maximum of a small fraction (0.1 to 0.2) of a body length. The maximum rms angle of attack and attitude angle are found to be only several degrees. These results are obtained for the case of a quite rough sea, namely that associated with rms surface wave heights of about 8 ft.

Ballistic Research [Labs.] Aberdeen Proving Ground, Md.
FM SYSTEM OF BLAST MEASUREMENT, by Phil Weiss. 2 Oct 44, 19p. Rept. no. 492.
Order from LC mi$2.40, ph$3.30 PB 140 362

A new method of measuring air blast from bombs is described, and illustrated by field tests. A ratio transmitter placed near the bomb is frequency modulated by a condenser-microphone. The radio signal is received at a distant point, where a heterodyne arrangement causes a neon light to flash at an audio frequency proportional to the instantaneous pressure on the condenser microphone. This flashing light is photographed on continuously moving film. A complete pressure-time curve can be computed from the frequency of flashes, and the impulse of the positive or negative phase is found by merely counting flashes. Using this method, impulses of 90 bombs of all sizes from 100 lb. to 10,000 lb. were measured, with a standard error of the mean of ten observations of 1.5%. The calibrations and records obtained by this system depend only on the gage and one tuned circuit in the transmitter. Changes in voltages, line impedances, amplifier characteristics, time constants, cable signal, tube microphonics, etc., have no effect on the results.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
THE MAGNUS FORCE ON A SHORT BODY AT SUPERSONIC SPEEDS, by A. S. Platou. Jan 59, 42p. 5 refs. Rept. no. 1062.
Order from LC mi$3.30, ph$7.80 PB 139 948

The recent information obtained through the testing of spinning models in the Aberdeen supersonic wind tunnels has led to a better understanding of the behavior of the Magnus force generated on rotating projectiles. Data have been obtained at Mach 2.0 on a low fineness ratio (3.2) body of revolution. Spin rates up to 40,000 r.p.m. ($\frac{\omega d}{U} \approx .40$) have been used which cover the spin range used by conventional bullets and shell.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
METHOD OF REDUCING THEODOLITE OBSERVATIONS OF MISSILE TRAJECTORIES CONSIDERING A SPHERICAL EARTH, by Albert A. Bennett, July 49, 39p. BRL rept. no. 699.
Order from LC mi$3.00, ph$6.30 PB 139 930

This report compares correct distances, taking account of a spherical earth, with distances computed as though points at constant altitude measured from mean sea level were in a plane. When the observing stations are well spread out, the flat-earth theory is an inadequate first approximation.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
ON THE FREE FLIGHT MOTION OF MISSILES HAVING SLIGHT CONFIGURATIONAL ASYMMETRIES, by John D. Nicolaides. June 53, reprinted May 58. 86p. 33 refs. Rept. no. 858.
Order from LC mi$4.80, ph$13.80 PB 139 927

Two models of a simple arrow type missile having control surface deflection are gun-launched at supersonic velocity in the Aberdeen Spark Photography Range and the free flight pitching and yawing motion and the transverse displacement are measured. The tricyclic theory is fitted to the experimental data. The results indicate that the theory accurately represents the actual motion of the two models and that the associated static and dynamic aerodynamic derivatives are accurately determined.

Case Inst. of Tech., Cleveland, Ohio.
AN EXPERIMENTAL INVESTIGATION OF THE TWO-DIMENSIONAL MAGNUS EFFECT, by W. M. Swanson. Final rept. on Contract DA 33-019-ORD-1434. 31 Dec 56, 210p. 30 refs. AD-122 945.
Order from LC mi$9.30, ph$13.80 PB 135 712

The simplest configuration of a rotating, infinitely long cylinder with its axis of rotation perpendicular to the direction of the wind stream is considered. Experimental values of lift and drag coefficients as a function of the ratio of peripheral to wind stream velocity and of the Reynolds number (based on cylinder diameter and free stream velocity) are presented over a wider range of variables than previously available.

Centronix, Inc., Cocoa, Fla.
SIX (6) CHANNEL DIRECT WIRING RECORDER. Final development rept. for May 54 - July 57 on Contract AF 08(606)908. [1957] 50p. AFMTC TR-57-27; AD-124 152.
Order from LC mi$3.60, ph$9.30 PB 136 466

A 30-channel direct writing recorder system was designed into a single 84-in. -high equipment rack which contains five 6-channel recorders. A reliable heated stylus was designed and mass produced which uses

less than the maximum allowable power and scribes the required trace. The chart material which produces excellent diazo (Ozalid) reproductions is stronger than paper yet so thin that 1200 ft may be inserted in the magazine rather than the required 500 ft. A system for scribing rectilinearly was used with less than half the allowable theoretical error and a smaller actual error. The magazine arrangement permits all loading operations without rear or side access. The chart may be driven at any of 8 synchronous speeds whose accuracy is better than ±1%. The required maximum deflection, sensitivity, and linearity was achieved. The design requirements specify that the response to a square-wave signal must not require longer than 40 msec with an overshoot not to exceed 5%. The square-wave response characteristics was attained without reducing the input impedance or deflection sensitivity.

Explosives Research Group, U. of Utah, Salt Lake City.
GENERATION OF HIGH VELOCITY PROJECTILES WITH HIGH EXPLOSIVES, by R. T. Keyes and M. A. Cook. Rept. on Contract AF 18(603)100. 1 Oct 57, 23p. 7 refs. AFOSR-TN-57-696; AD-136 698.
Order from LC mi$2.70, ph$4.80 PB 136 441

A technique of controlling the shape of detonation wave fronts in high explosives by inert wave control inserts was applied to generate discrete ultra-high velocity pellets. Tests to determine the most suitable pellet shape as well as the optimum charge configuration are described, and velocities up to 7600 m/sec were realized for 0.95 g aluminum pellets. The mechanism whereby pellets are accelerated by "shaped" waves is discussed, and the conclusion was reached that a simple model based upon the transmission of shock from the detonation wave to the pellet was not applicable.

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
AERIAL DELIVERY OF AMMUNITION AND EXPLOSIVES, by E. Jack Hottinger. Mar 59, 69p. 33 refs. Technical rept. 2591; AD-206 552.
Order from LC mi$3.90, ph$10.80 PB 140 024

By a series of twenty-one missions, it was determined that, with minor exceptions, a variety of representative ammunition items can be successfully delivered by parachute without endangering friendly troops and without damaging the ammunition enough to affect its functioning. The ammunition was packed in horizontal position and ejected from a C-119 cargo plane traveling 150 miles an hour at an altitude of 1200 - 1500 feet, so that it would land on firm ground. In most of the drops (when the parachutes functioned normally) the ammunition was unaffected and the packing suffered only negligible damage. As had been expected, when the parachute malfunctioned and free falls occured, the packaging was damaged and some of the ammunition was rendered unsuitable for use. At no time, however, was it unsafe to handle.

Feltman [Research and Engineering] Labs., Picatinny Arsenal, Dover, N. J.
BALLISTIC EVALUATION OF REWORKED M1 AND M6 PROPELLANTS, by Russell L. Trask. Oct 57, 24p. 8 refs. Technical rept. 2396.
Order from LC mi$2.70, ph$4.80 PB 135 092

M1 and M6 propellants of obsolete granulations can be utilized in the manufacture of stable M1 and M6 propellants in granulations currently required for field use. The ballistic performance of reworked propellants is satisfactory at ambient and extreme temperatures. The satisfactory surveillance life of the reworked propellants suggests the applicability of the processing technique used in this investigation to the reworking of propellants of questionable stability.

[Feltman Research and Engineering] Labs., Picatinny Arsenal, Dover, N. J.
INVESTIGATION OF A PREMATURE OF A COMPOSITION B-LOADED 120 MM T15E3 HE-T SHELL, by Samuel D. Stein and Robert G. Salamon. Jan 58, 34p. 8 refs. Technical rept. 2507.
Order from LC mi$3.00, ph$6.30 PB 135 861

The premature of the 120 mm T15E3 HE-T shell was caused by failure of the body due to excessive stress at the rear edge of the forward rotating band, aggravated by severe stress concentration and also by the abnormally high chamber pressure (45,900 psi). Composition B-loaded 120 mm T15E3 HE-T shell may be safely fired at maximum excess chamber pressures averaging 42,500 psi. A base separation up to 1/16" in a Composition B-loaded shell will not by itself cause the explosive to explode prematurely.

High Altitude Observatory, Boulder, Colo.
SCIENTIFIC REPORT NO. 10, by James W. Warwick. Rept. for 1 Oct-31 Dec 57 on Contract AF 19(604)1491. Apr 58, 56p. 15 refs. AFCR TN-58-134; AD-152 362.
Order from LC mi$3.60, ph$9.30 PB 135 210

The problem of reduction of tracking information occupies Section I of the report. Section II contains, essentially, a catalogue of the various types of ionospheric fading and peculiar interferometric effects that the Russian satellites produced. Section III presents an analysis of the most basic fading shown on the records. The final section of the report is a bibliography and annotation for the preceding sections.

Office of Naval Research, Washington, D. C.
PROBLEMS OF SATELLITES AND SPACE OPERATIONS. Lecture Series, Apr-July 58, 111p. ONR-4; AD-208 341.
Order from OTS $2.50 PB 151 410

Contents:
Problems of the space age, by Donald H. Menzel
Some objectives of space research, by Homer E. Newell, Jr.
Space navigation and celestial mechanics, by Gerald M. Clemence

Satellite tracking, by John P. Hagen
Satellite payload optimization, by N. Whitney Matthews
Astronomy and space operations, by Fred L. Whipple
Space communications, by Jerome B. Wiesner
The national aeronautics and space administration, by Hugh L. Dryden

Office of Scientific Research and Development. Div. 1.
INTERIOR BALLASTICS. III, by J. O. Hirschfelder, R. B. Kershner and J. H. Sherman (Geophysical Lab., Carnegie Institution of Washington) Rept. on Contract OEMsr-51. 1953, declassified 11 Feb 55, 97p. 10 refs. Armor and Ordnance rept. no. A-204; OSRD no. 1677; ATI-24 848.
Order from LC mi$5.40, ph$15.30 PB 140 008

The system of interior ballistics previously presented in NDRC Reports A-142 and A-180 (OSRD Nos. 1236 and 1435) is further modified and rearranged to make it more convenient for the solution of certain problems related to the design of new guns. A series of tables have been prepared to assist in the solution of such problems as: (i) the minimum length of gun required for a preassigned muzzle velocity at a preassigned maximum pressure; (ii) the most desirable chamber volume and density of loading; (iii) the change in muzzle velocity which would result from a small change in maximum pressure, gun length or density of loading; (iv) the change in muzzle velocity caused by a change in the composition of the powder. The use of the tables is illustrated by numerical examples.

Office of Scientific Research and Development. Div. 1.
INTERIOR BALLISTICS. V. PERFORMANCE OF HIGH-VELOCITY GUNS, by J. O. Hirschfelder, R. B. Kershner and others (Geophysical Lab., Carnegie Institution of Washington). Rept. on Contract OEMsr-51. Oct 43, declassified 1956. 62p. 7 refs. Armor and Ordnance rept. no. A-222; OSRD no. 1916; ATI-25 027.
Order from LC mi$3.90, ph $10.80 PB 140 007

The main interior ballistic factors of gun design are condensed into a set of tables from which it is very easy to obtain the characteristics of all possible guns satisfying any specified requirements. The remainder of the report applies these tables to a thorough quantitative discussion of the effect of varying each of the major ballistic factors. Specific guns and powders are considered. The calculations and discussion extend into the range of hypervelocities.

Picatinny Arsenal, Dover, N. J.
DEVELOPMENT OF IMPROVED ILLUMINANT FOR ILLUMINATING SHELL, 105 MM, M314A1, by William J. Nolan and Herbert Dorfman. May 54, 33p. 7 refs. Technical rept. no. 2027.
Order from LC mi$3.00, ph$6.30 PB 140 246

An improved illuminant composition has been developed for the 105 mm Illuminating Projectile which yields more than twice the candlepower of the former standard illuminant composition.

Picatinny Arsenal, Dover, N. J.
USE OF WATER-COOLED CONVEYOR BELT FOR MANUFACTURE OF CAST EXPLOSIVE PELLETS, by E. Jescerzewski and M. Baer. Preliminary Study. June 58, 9p. Technical rept. DB-TR:7-58.
Order from LC mi$1.80, ph$1.80 PB 135 104

This project was intended to determine the feasibility of manufacturing the pellets by a continuous casting system, utilizing a water-cooled, steel conveyor belt. The apparatus is essentially a motor-driven horizontal conveyor belt for cooling chemicals and allied materials. Cooling takes place from the underside of the belt, using water or other prescribed coolant. Molten explosive, poured directly onto one end of the belt, becomes progressively cooled and solidified as the belt travels its course. The cast would be broken or cut into pellets of desired size, upon solidification.

Pickard and Burns, Inc., Needham, Mass.
RADIO TRACKING OF EARTH SATELLITES. Scientific rept. no. 1 on Contract AF 19(604)1588. 30 June 58, 141p. 24 refs. AFCRC-TN-58-353; AD-160 846.
Order from LC mi$7.20, ph$22.80 PB 139 915

Contents:
Satellite orbital data
  Example of orbital data - 1958 delta (Sputnik III)
Application of doppler theory
  Doppler equations - plane earth and constant velocity
  Doppler equations - curved earth, constant orbital speed
Instrumentation for doppler frequency measurements and analysis
  Doppler network and real time data transmission
  Doppler network and non-real time data transmission
  Data reduction at each receiver - non-real time data transmission
  Data processing and reduction equipment
Some experimental results
  Example of doppler data analysis - Sputnik I
  Sputnik II - doppler and interferometer
  U. S. satellites
  Sputnik III - 1958 - Delta
Laws of satellite motion
Energy relations and orbital velocity
Perturbations of satellite motion

Rock Island Arsenal Lab., Ill.
EXPERIMENTAL PACKAGING OF THE CAL. 30 M1 CARBINE IN VOLATILE CORROSION INHIBITOR (VCI) MATERIALS, by F. H. Wayne. Apr 58, 14p. Rept. no. 58-818.
Order from LC mi$2.40, ph$3.30 PB 135 111

Rome Air Development Center, Griffiss AFB, N. Y.
PERFORMANCE EQUATIONS FOR A STATIONARY PASSIVE SATELLITE RELAY FOR COMMUNICATION (22,000 MILE ALTITUDE), by Morris Handelsman. Jan 59, 21p. 21 refs. RADC TN-58-379; AD-206 898.
Order from LC mi$2.70, ph$4.80 PB 139 951

Performance equations are given for the use of a single fixed satellite used as a passive bounce point for

almost hemispherical coverage of the earth for communication purposes. The antenna size and transmitter power per cps of bandwidth for desired (S/N) ratio at r.f. are given for various types of passively-reflecting satellites. Possible limitations due to terrestrial and extra-terrestrial noise and future possibilities using low-noise receivers are discussed.

Sciaky Bros., Inc. Los Angeles, Calif.
WELDING DEVELOPMENT PROGRAM FOR THIN WALL MUNITIONS CLOSURES, by Salvatore M. Robelotto. Summary rept. on Contract DA 18-108-cml-5860. Apr 57, 46p. AD-138 789.
Order from LC mi$3.30, ph$7.80 PB 135 345

Twenty closure designs were developed and thoroughly tested for helium leakage and weld strength. Four (100 specimen) consistency runs, made under production conditions, produced data substantiating the reliability of the resistance welding process. Welding machine size requirements and specific materials were determined and finalized as were test methods, instrumentation and closure designs. Data sheets and weld schedule information is presented at the end of the report.

Springfield Armory, Mass.
AN EVALUATION OF A DIELECTRIC HEATING METHOD FOR DRYING BLACK WALNUT GUNSTOCK BLANKS, by K. A. Jorczak. 27 Feb 58 15 p. SA-TR18-1058.
Order from OTS $0.50 PB 151 301

The electro-kiln method of drying lumber is a new application of dielectric heating, and has gained considerable attention as evidenced by both domestic and foreign trade interest in the process. The underlying principle of the new method is the generation of heat within the core of the wood by dielectric heating. The power is supplied by a radio frequency generator oscillating at a frequency of 6.5 megacycles per second. Consequently, the heat radiates outward from the core of the wood driving the internal moisture before it to the surface. Herein lies the advantage relative to reduction in process time over the conventional method of kiln drying lumber, for in the conventional method, the heat is applied externally to the wood and maintained under established conditions of temperature and humidity. Under these operating conditions the drying process depends on the rate of evaporation of the surface moisture and the slow capillary action of the wood cells to conduct the internal moisture outward to the surface. Another distinctive feature of the new method is that the temperature gradient relative to the wood and kiln atmosphere can be rapidly established and maintained or controlled to suit the requirements of the wood in process.

Springfield Armory, Mass.
GENERAL OPERATING ACCURACIES IN FLUORESCENT X-RAY SPECTROSCOPY, by H. R. Erard. Rept. on Study, Develop and Improve Procedures and Standardize Instruments for Methods of Chemical Analysis Applicable to the Manufacture of Small-Arms Weapons and Components. 21 Oct 57, 56p. 1 ref. SA-TR20-2405.
Order from LC mi$3.60, ph$9.30 PB 140 358

The purpose of this investigation was fourfold: (1) To evaluate types of error encountered in X-ray spectroscopy. (2) To develop techniques for minimizing error. (3) To compare known techniques with respect to precision of measurement and time required. (4) To determine attainable precision of measurement and time required for analysis of various ranges of element concentration with the fluorescent X-ray method.

Springfield Armory, Mass.
STATISTICAL EVALUATION OF VARIOUS METHODS OF TARGETING M1 RIFLES IN CONNECTION WITH BORESIGHTING OPERATION, by J. F. O'Neil. Jan 53, 104p. SA-MR11-1077.
Order from LC mi$5.70, ph$16.80 PB 135 002

An investigation was undertaken to determine which of four methods of firing (standard machine rest, hydraulic machine rest, muzzle and elbow, and prone) gives the most consistently accurate results when the standard M1 Rifle is fired. The hydraulic machine rest offers the greatest speed and ease of operation and, with slight modifications, will provide the most consistent accuracy. The standard machine rest might be employed as a substitute while the hydraulic rest is being redesigned. Muzzle and elbow firing could be used satisfactorily in small tests where target fatigue would not be a factor. Prone firing is undesirable.

Sanitation and Safety Engineering

[Army] Engineer Research and Development Labs., Fort Belvoir, Va.
EVALUATION OF THE CORPS OF ENGINEERS MOBILE WATER PURIFICATION UNIT FOR THE REMOVAL OF PATHOGENIC BIOLOGICAL WARFARE AGENTS FROM WATER: "SALTY DOG II," by Don C. Lindsten. 23 Dec 54, declassified 7 June 56. 69p. Rept. 1390.
Order from LC mi$3.40, ph$10.80 PB 135 910

As an essential supplement to the current development of new water purification equipment and methods, a field evaluation was made of the engineering-test-model, Water Purification Unit, Mobile, Electrified, 1500 GPH. The equipment and operating techniques were evaluated for removing Biological Warfare (BW) contaminants from water. The agents used were: Salmonella typhosa, a vegetative bacterium and causative agent of typhoid fever; Coxiella burnetti, a rickettsia and causative agent of "Q" fever; and Clostridium botulinum toxin, a poison and causative agent of botulism. A non-pathogenic agent, Escherichia coli, was also used for test control purposes. It was concluded that the unit will remove, kill, or inactivate Escherichia coli, Salmonella typhosa, Coxiella burnetti, or Clostridium botulinum toxin in water when operated according to the normal procedures of continuous coagulation, diatomite filtration, and chlorination to a residual of 1 ppm.

[Army] Engineer Research and Development Labs., Fort Belvoir, Va.
REMOVAL OF RADIOACTIVE MATERIALS FROM WATER BY THE WATER PURIFICATION UNIT, HAND-OPERATED, KNAPSACK-PACK, FILTER-PAD-TYPE, 1/4-GPM, AND BY A FIELD EXPEDIENT; SALTY DOG III, by William J. Lacy, Arthur L. Donahew and others. 19 May 55, declassified 22 Oct 57. 32p. 4 refs. Rept. 1404.
Order from LC mi$3.00, ph$6.30 PB 140 084

The information contained herein, together with the drinking water tolerances noted, provide an adequate basis for the preparation of essential and urgently needed instructional material.

Army Engineer Research and Development Labs., Fort Belvoir, Va.
WATER PURIFICATION PLANT, 10,000-GPH, by Joseph F. Mancuso and Richard P. Schmitt. 24 Apr 58, 54p. 2 refs. Technical rept. 1521-TR.
Order from LC mi$3.60, ph$9.30 PB 139 842

This report covers the development, tests, and evaluation of water purification equipment suitable for installations at hospitals, remote air bases, and troop staging areas. The assemblage of equipment employs the necessary facilities and techniques for producing drinking water in the field from turbid and contaminated surface water sources. Equipment and all necessary facilities for a complete 10,000-gph water purification plant, including housing, were obtained. Engineering tests included approximately 60 days of operation treating Potomac River water. The same unit was then service tested continuously 24 hours per day 5 days per week for approximately 8 months.

Chemical Corps, Army Chemical Center, Md.
FILTER UNIT; GAS AND PARTICULATE, EMD, 600 CFM, M9. 21 Aug 58, 7p. 31 dwg. Chemical Corps Purchase Description no. 197-54-688.
Order from LC mi$7.50, ph$24.30 PB 139 959

This purchase description includes the following drawings:
Filter Unit, Gas-Particulate, EMD, 600 CFM, M9:
D5-19-2157. Bill of Material
B5-19-2158. List of Drawings, Specifications and Standards
E5-19-2156. Assembly
B5-19-1182. Frame, Rainshield
C5-19-2164. Transition, Air Inlet. Assembly and Detail
C5-19-2048. Transition-Flexible Tubing. Assembly and Detail
E5-19-2159. Skid. Assembly and Detail
C5-19-2095. Holder, Flexible Tubing. Assembly and Detail
C5-19-2160. Motor-Blower. Assembly and Detail
C5-19-2162. Flange, Blower Outlet. Assembly and Detail
D5-19-1180. Rainshield. Assembly, Detail and Bill of Material
D5-19-1181. Blank, Rainshield
Filter, Gas and Particulate, 600 CFM, M14:
A5-19-2022. List of Drawings and Specifications
B5-19-2023. Bill of Material
D5-19-2024. Assembly
Filter, Particulate, 600 CFM, C18:
A5-19-2057. List of Drawings and Specifications
B5-19-2058. Bill of Material
C5-19-2031. Assembly
B5-19-2025. Separator, Fluted
B5-19-2026. Panel, Outer
B5-19-2027. Panel, Inner
C5-19-2030. Filter, Pleated. Assembly and Detail
Filter, Gas, 600 CFM, C22:
A5-19-2059. List of Drawings and Specifications
C5-19-2060. Bill of Material
D5-19-2034. Assembly and Detail
C5-19-2028. Panel, Filter, Top and Bottom
C5-19-2029. Panel, Filter, Side
Filter, Gas, 60 CFM, C10:
A5-19-2055. List of Drawings and Specifications
C5-19-2056. Bill of Material
D5-19-2032. Assembly
D5-19-2033. Frame, Filter. Assembly and Detail

Chemical Corps, Army Chemical Center, Md.
FILTER UNIT: GAS AND PARTICULATE, EMD, 1200 CFM, M10. 21 Aug 58, 7p. 28 dwg. Chemical Corps Purchase Description no. 197-54-594A, supersedes 197-54-594.
Order from LC mi$6.90, ph$21.30 PB 139 958

This purchase description includes the following drawings:
Filter Unit, Gas-Particulate, EMD, 1200 CFM, M10:
D5-19-2192. Bill of Material
B5-19-2191. List of Drawings, Specifications and Standards
D5-19-2193. Assembly
D5-19-2189. Transition, Flexible Tubing. Assembly and Detail
C5-19-2190. Transition, Air Inlet. Assembly and Detail
D5-19-2194. Skid. Assembly and Detail
D5-19-2195. Holder, Flexible Tubing. Assembly and Detail
D5-19-2185. Motor-Blower. Assembly and Detail
D5-19-1101. Rainshield. Assembly, Detail, and Bill of Material
D5-19-1102. Blank, Rainshield
Filter, Gas-Particulate, 1200 CFM, M15:
A5-19-2083. List of Drawings and Specifications
B5-19-2084. Bill of Material
D5-19-2085. Assembly
Filter, Gas, 1200 CFM, C32:
A5-19-2071. List of Drawings and Specifications
C5-19-2072. Bill of Material
C5-19-2073. Assembly and Detail.
C5-19-2074. Panel, Filter, Top and Bottom
C5-19-2075. Panel, Filter, Side
Filter, Gas, 120 CFM, C31:
A5-19-2067. List of Drawings and Specifications
C5-19-2068. Bill of Material
C5-19-2069. Assembly
C5-19-2070. Frame, Filter, 2 Cell. Assembly and Detail
Filter, Particulate, 1200 CFM, C19:
A5-19-2076. List of Drawings and Specifications
C5-19-2077. Bill of Material
C5-19-2078. Assembly.
B5-19-2079. Separator, Fluted
B5-19-2081. Panel, Outer
B5-19-2082. Panel, Inner

Chemical Corps, Army Chemical Center, Md.
FILTER UNIT; GAS AND PARTICULATE, EMD 2500 CFM, M11. 21 Aug 58, 7p. 23 dwg. Chemical Corps Purchase Description no. 197-54-689.
Order from LC mi$5.40, ph$15.30 PB 139 957

This purchase description includes the following drawings:
Filter Unit, Gas Particulate, EMD, 2500 CFM, M11:
D5-19-2198. Bill of Material
B5-19-2197. List of Drawings, Specifications and Standards
D5-19-2199. Assembly
C5-19-2203. Transition, Air-Inlet. Assembly and Detail
C5-19-2204. Transition, Flexible Tubing. Assembly and Detail
D5-19-2200. Skid. Assembly and Detail
D5-19-2201. Holder, Flexible Tubing. Assembly and Detail
C5-19-2205. Motor-Blower. Assembly and Detail
Filter, Gas and Particulate, 2500 CFM, M16:
A5-19-2133. List of Drawings and Specifications
B5-19-2134. Bill of Material
D5-19-2114. Assembly
Filter, gas, 2500 CFM, C29:
A5-19-2133. List of Drawings and Specifications
B5-19-2124. Bill of Material
D5-19-2117. Assembly and Detail
B5-19-2132. Panel, Filter, Side
C5-19-2118. Panel, Filter, Top and Bottom
Filter, Particulate, 2500 CFM, C30:
A5-19-2127. List of Drawings and Specifications
C5-19-2128. Bill of Material
C5-19-2115. Assembly
B5-19-2130. Separator, Fluted
B5-19-2131. Panel, Outer
C5-19-2120. Panel, Inner
C5-19-2129. Filter, Pleasted. Assembly and Detail

Chemical Corps, Army Chemical Center, Md.
FILTER UNIT: GAS AND PARTICULATE, EMD, 5000 CFM, M12. 21 Aug 58, 7p. 45 dwg. Chemical Corps Purchase Description no. 197-54-582A, superseded 197-54-582.
Order from LC mi$8.70, ph$30.30 PB 139 960

This purchase description includes the following drawings:
Filter Unit, Gas-Particulate, EMD, 5000 CFM, M12:
D5-19-2036. Bill of Material
A5-19-2035. List of Drawings, Specifications and Standards
D5-19-2007. Assembly
A5-19-1097. Protector, Corner
B5-19-1094. Loop, Footman
B5-19-1121. Frame, Rainshield
B5-19-1137. Retarder, Skid
B5-19-2146. Strap. Assembly and Detail
Dr-19-2041. Transition, Flexible Tubing. Assembly and Detail
C5-19-2039. Transition, Air Inlet. Assembly and Detail
C5-19-1291. Strap. Assembly
E5-19-2037. Skid. Assembly and Detail
B5-19-1095. Plate, Anchor
B5-19-1096. Bolt, Eye
D5-19-2042. Holder, Flexible Tubing. Assembly and Detail
B5-19-2176. Stop
D5-19-2040. Motor-Blower. Assembly and Detail
B5-19-2173. Panel
C5-19-2038. Flange, Blower Outlet. Assembly and Detail
D5-19-1123. Rainshield. Assembly, Detail and Bill of Material
D5-19-1122. Blank, Rainshield
Filter, Gas and Particulate, 5000 CFM, M17:
A5-19-2005. List of Drawings and Specifications
B5-19-2006. Bill of Material
D5-19-2016. Assembly
B5-19-2011. Cleat
Filter, Gas, 5000 CFM, C23:
A5-19-2051. List of Drawings and Specifications
C5-19-2052. Bill of Material
D5-19-2015. Assembly and Detail
B5-19-1139. Screwnail
Filter, Particulate, 5000 CFM, C20:
A5-19-2053. List of Drawings and Specifications
B5-19-2054. Bill of Material
D5-19-2019. Assembly
B5-19-2008. Separator, Fluted
B5-19-2009. Panel, Outer
B5-19-2010. Panel, Inner
D5-19-2018. Filter, Pleated. Assembly and Detail
Filter, Gas, 250 CFM, C21:
A5-19-2049. List of Drawings and Specifications
C5-19-2050. Bill of Material
D5-19-2014. Assembly
A5-19-672. Gasket, Washer, Cup
B5-19-2012. Bolt, Draw. Assembly
B5-19-2236. Washer, Cup
C5-19-750. Sheet, Perforated
C5-19-2237. Filter, Fines
D5-19-2013. Frame, Filter. Assembly and Detail

Ship Building

California U., Berkeley.
STRESS-STRAIN RELATIONS FOR THE PLASTIC DEFORMATION OF ANISOTROPIC METALS, by J. E. Dorn. Progress rept. no. 3 on Contract N6ori-111(04). June 47, 46p. 22 refs. AD-200 995.
Order from LC mi$3.30, ph$7.80 PB 139 980

A simple theory for the plastic deformation of anisotropic materials is proposed. According to this theory the plastic behavior of an anisotropic plate is characterized by a work hardening curve and a number of constant parameters that define the kind and degree of anisotropy. The theory does account qualitatively, for many observations on plastic flow.

David Taylor Model Basin, Washington, D. C.
THE CALCULATION OF THE CIRCULATION DISTRIBUTION FOR PROPELLERS WITH FINITE HUB HAVING THREE, FOUR, FIVE, AND SIX BLADES, by A. J. Tachmindji and A. B. Milam. June 57, 41p. 9 refs. Rept. 1141.
Order from LC mi$3.30, ph$7.80 PB 139 987

The present report gives the results of calculations for the optimum circulation distribution for propellers

having a finite number of blades and finite hub diameters. The calculations were performed for hub diameters of 0.2, 0.3 and 0.4 of the propeller diameters and a method for interpolating between these values is also included.

David Taylor Model Basin, Washington, D. C.
PROPELLER INDUCTION FACTORS, by W. B. Morgan. Nov 57, 73p. 4 refs. Rept. 1183.
Order from LC mi$4.50, ph$12.30 PB 139 988

Calculations have been performed for the induction factors of 2, 3, 4, 5, 6, 7 and 8 bladed propellers over a range of β_i from 5^o to 80^o. The results are presented in tabular form for both the axial and tangential induction factors.

David Taylor Model Basin, Washington, D. C.
PROPELLER PITCH CORRECTION ARISING FROM LIFTING SURFACE EFFECT, by H. W. Lerbs. Feb 55, 17p. 7 refs. Rept. no. 942.
Order from LC mi$2.40, ph$3.30 PB 139 986

Experience has shown that propellers designed from the theory of a moderately loaded propeller are underpitched. An attempt is made in the following discussion to trace the reason for this discrepancy between theory and experience and, further, to develop relations from which the additional pitch may be approximately determined.

David Taylor Model Basin, Washington, D. C.
RESPONSE OF A SIMPLE FLOATING STRUCTURE TO UNDERWATER EXPLOSION ATTACK, by Erich Buchmann. June 57, 19p. 5 refs. Rept. 1019.
Order from LC mi$2.40, ph$3.30 PB 136 103

The response of a simple floating target simulating a structure subjected to underbottom explosion attack has been determined and correlated with various phases of the explosion phenomena. The target was a wooden block with a bottom consisting of an airbacked steel plate of varied thickness clamped at the edge. The velocity of the wooden block and the relative velocity of the center of the steel bottom with respect to the wooden block were measured. The motion of the center of gravity was found to be the same as that of the water displaced by the target calculated as if the target were absent. The bottom and top of the target also vibrated in a manner resembling a system of two spring-connected masses. The amplitudes of vibration could be derived from the motion of the water due to the explosion. A few tests were made to determine the effect on the motion of installing a sponge rubber bottom on the wooden block. The maximum accelerations of the block were reduced.

George Washington U., Washington, D. C.
AN EXAMINATION OF USAGE OF SHIPS PARTS FOR TWO DESTROYERS, by Mina Haskind Gourary. Rept. on Logistics Research Proj. Contract Nonr-761(05). June 58, 18p. Serial T-89/58.
Order from LC mi$2.40, ph$3.30 PB 139 845

It is clear that in ships without central storerooms the time at which a given demand is made does not necessarily coincide exactly with the time when the demanded part is used. With items of small usage, small variations in the usages would normally be assumed to be significant. The Allowance List is inadequate in range and overstocked in depth. A change in requisitioning practices may make it possible to cut the Allowance List drastically in depth while greatly extending its range and at the same time providing better support.

Institute of Engineering Research, U. of California, Berkeley.
EFFECT OF CARGO HATCH SIZE ON SHIP GIRDER STRENGTH, by R. W. Clough, Joseph Penzien and others. Technical rept. no. 1 on Maritime Cargo Transportation, Contract Nonr-222(36). July 57, 82p. 60 refs. Series no. 105, Issue no. 1.
Order from LC $mi4.80, ph$13.80 PB 135 004

This report describes a series of model tests which were conducted to determine the stresses around hatch openings of varying sizes when the model was subjected to the same types of loading as a cargo ship, i.e., to bending and twisting moments.

Johnson, A., and Co., Inc.
A MODEL STUDY OF SEVERAL CONTROLLABLE-PITCH PROPELLER BLADES FOR TUGBOAT SERVICE. Rept. on Contract DA 44-177-tc-406. Dec 57, 114p. 3 refs. Rept. 571; DA Proj. 9-97-40-000, Subtask 16; AD-148 491.
Order from LC mi$6.00, ph$18.30 PB 137 565

An investigation was conducted in an effort to determine an optimum propeller blade form as regards effective tow rope pull for a controllable pitch propeller to be used for tugboat service. The relative merits of two basically different propeller blade forms were investigated and also compared with a fixed pitch propeller.

Material Lab., New York Naval Shipyard, Brooklyn.
EVALUATION OF EMERGENCY DAMAGE CONTROL METALLIC PIPE REPAIR KITS FOR LOW PRESSURE STEAM SYSTEMS, by I. Resnick. Final rept. 12 May 58, 9p. 6 refs. Lab. Project 5330-4.
Order from LC mi$1.80, ph$1.80 PB 137 430

Emergency damage control metallic pipe repair standard stock kit containing air epoxy resin-hardener system and glass fiber reinforcement, for repairs to low pressure steam, gasoline, and heavy end aviation fuel (HEAF) systems. Tests of patches on steel pipe carrying low pressure steam. The patches withstood circulating steam pressures up to 245 psi without evidence of failure.

Naval Research Lab., Washington, D. C.
EVALUATION OF EXPERIMENTAL MODEL OF PROPELLER SHAFT R.P.M. MASTER INDICATOR-TRANSMITTER, ELECTRIC TACHOMETER CORPORATION, EXHIBITOR, by G. Pida and G. K. C. Hardesty. May 47, 32p. 5 refs. Rept. no. B-3061.
Order from LC mi$3.00, ph$6.30 PB 132 998

The Master Indicator-Transmitter is the principal part of a proposed new design of a Propeller Shaft Revolution Indicator System. It is designed to indicate locally as well as to transmit to Repeater-Indicators the speed and total revolutions of a ship's propeller shaft. This Master Indicator-Transmitter differs from the conventional type in that no follow-up (servo) motor is employed.

Stanford U., Calif.
OCEAN WAVESLOPES IN RELATION TO SHIP STABILIZATION. Rept. on Contract N6onr-251(29). July 51, 35p. 4 refs. Div. of Engineering Mechanics Technical memo. no. 4; ATI-206 729.
Order from LC mi$3.00, ph$6.30 PB 139 735

Contents:
The rolling motion of a vessel
Waveslope information required for design of stabilizer
Reliability of waveslope data
Graphical computation of effective waveslope

FOOD, HANDLING, AND PACKAGING EQUIPMENT

Agricultural Marketing Service, Chicago, Ill.
CONTROL OF POST HARVEST DISEASES OF FRUITS AND VEGETABLES BY RADIATION TREATMENTS, by Louis Beraha and G. B. Ramsey. Rept. no. 7 (Final), 1 Mar 55-30 Sep 56, on Contract 49-106-087-55. [1956] 51p.
Order from LC mi$3.60, ph$9.30 PB 134 699

Experiments with artificially inoculated fruits kept under conditions favoring development of decay have been made employing gamma radiation to determine the possibility of extending the shelf and storage life of fresh fruits. Observations have been made of changes which alter both texture and color after prolonged storage periods.

New York State Agricultural Experiment Station, Geneva.
PECTIN STABILITY STUDIES, by Z. I. Kertesz. Rept. no. 5 (Final), 28 Feb 55-30 Sep 56, on Contract DA 19-129-qm-297. [1956] 23p. 12 refs. AD-202 320.
Order from LC mi$2.70, ph$4.80 PB 136 676

The investigation was conducted in two phases. The first one constituted a study of storage stability of the dehydrated product under various conditions, the second consisting of a search for any relationship between the viscosity of pectin isolated from stored cranberry powder and sauce (jelly) firmness, and a comparison of the thermal stability of cranberry pectin with pectins isolated from various other plant sources.

Packaging

California U., Los Angeles.
ENGINEERING ANALYSIS OF CARGO HANDLING. VI. CONTAINERIZATION, by Joseph D. Carrabino. Rept. on Determination of Optimum Sizes and Economic Feasibility of Shipping Containers, Contract Nonr-233(07). July 57, 196p. 20 refs. Dept. of Engineering rept. 57-56; AD-152 322.
Order from LC mi$8.70, ph$30.30 PB 135 713

The containerization of cargo represents one of the most promising innovations in the worldwide shipping industry. The high costs of loading and unloading ships have focused attention on the critical need for developing more effective handling methods. This monograph reports on research efforts which have resulted in the development of methodologies for determining: 1. The optimum sizes of shipping containers; this phase of the study included a unique application of a high-speed digital computer using simulation techniques. 2. The economic feasibility of containerization over palletization.

Materials Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
INVESTIGATION OF DESIGN CRITERIA FOR CUSHIONING MATERIALS, by Stewart M. Krakover and Albert Olevitch. Rept. for June 56-June 58 on Finishes and Materials Preservation. Mar 59, 35p. WADC Technical rept. 58-639; AD-201 227.
Order from OTS $1.00 PB 151 720

This report discusses the properties of cushioning materials significant for purposes of package cushioning design. Acceleration-static stress curves are the required dynamic property. It is shown that the minimum points of such curves reflect the most efficient operation of the cushioning materials. The other properties of significance are the static stress-strain and creep characteristics. Examples of the application of the significant properties in designing package cushioning are presented. The economic aspects of utilizing cushioning materials are dependent on knowledge of these properties and a formula relating cost to the significant properties is presented. The report also presents some design data on several different materials commonly available and the procedures for securing the design data. The report essentially is a text on the properties of cushioning materials and the design of package cushioning.

Rock Island Arsenal Lab., Ill.
EFFECT OF AIR FLOW ON VCI PROTECTION, by R. L. LeMar. May 58, 18p. 20 refs. Rept. no. 58-1170.
Order from LC mi$2.40, ph$3.30 PB 135 110

The object of this study was to determine the relative effects of two air flow rates on the corrosion inhibiting properties of five VCI papers and the value of VCI in a package when the package is not sealed against moisture and air flow.

Rock Island Arsenal Lab., Ill.
FUNGUS PROOF BARRIER MATERIALS, by Evelyn S. Burke. Rept. no. 2, 27 Feb 57, 35p. Rept. no. 57-496.
Order from LC mi$3.00, ph$6.30 PB 128 782

Two fungus proof barrier materials developed and evaluated were tested for inherent corrosiveness with respect to steel, copper, cadmium and zinc. One barrier was shown to be non-corrosive within the scope of the definition contained herein. The non-corrosive, fungus proof barrier was tested further for compatibility with various preservatives. Requirements and test methods for fungus resistance, corrosiveness and preservative compatibility of kraft-polyethylene laminations are included.

MACHINERY, FABRICATION, AND ACCESSORY EQUIPMENT

Bjorksten Research Labs., Madison, Wis.
DETECTION AND MEASUREMENT OF GEAR TOOTH CONTACT AND WEAR, by C. N. Ferguson and Richard M. Reese. Final rept. for 17 July 55-31 July 57 on Contract NObs-67038. Aug 57, 31p. 3 refs.
Order from LC mi$3.00, ph$6.30 PB 140 113

Two radioisotope plating techniques have been investigated and one has been selected for further study. The selected method gives great promise of giving a very satisfactory method of determining the thickness of the plating at any point upon an irregular surface by determining the intensity of radiation by autoradiographic techniques. Methods for the application of photographic emulsions for this technique to irregularly shaped surfaces have been partially perfected.

Bureau of Yards and Docks, Washington, D. C.
MACHINE: BASIC SUPPORTING DATA. Engineered Performance Standards, Public Works Maintenance. July 57, 292p.
Order from LC mi$11.10, ph$45.60 PB 139 767

Bureau of Yards and Docks, Washington, D. C.
MACHINE HANDBOOK. Engineered Performance Standards, Public Works Maintenance. Aug 57, 40p.
Order from LC mi$3.00, ph$6.30 PB 139 768

Engines and Propulsion Systems

Arnold Engineering Development Center, Tullahoma, Tenn.
EVALUATION OF A METHOD OF REMOVING BORON OXIDE PARTICLES FROM EXHAUST GASES, by Leroy J. David and R. P. Rhodes. Rept. on ARO, Inc. Contract AF 40(600)-700 S/A 13 (59-1). Nov 58, 36p. 4 refs. AEDC TN-58-89; AD-205 545.
Order from LC mi$3.00, ph$6.30 PB 137 991

Investigations were conducted to evaluate the performance of a cleaning system for removing solid products of combustion from jet engine exhaust gases. The cleaning system consisted primarily of spray water injected into the high velocity exhaust immediately downstream of the exhaust nozzle and additional spray water introduced well downstream of the exhaust nozzle in a low velocity region. An inertial separator was located downstream of the sprays in the low velocity region to remove entrained water from the gas stream. Removal efficiencies of 99.95 percent were obtained. Trimethyl Borate-Azeotrope was used as the test fuel.

Beryllium Corp., Reading, Pa.
HOT PRESSING OF BERYLLIA ROCKET NOZZLES, by J. K. Evans and G. D. Kriebel. Rept. on Ceramic and Cermet Materials, July 56-Jan 57, Contract AF 33(616)3699. Jan 57, 20p. WADC Technical rept. 57-86; AD-132 567.
Order from LC mi$2.40, ph$3.30 PB 140 363

The effects of time, temperature, pressure, and particle size on the density of hot pressed beryllium oxide were investigated. Experimental conditions and densities obtained are tabulated for two types of beryllium oxide and their mixtures. A description of the equipment, procedures, and starting materials is included. Photomicrographs of hot pressed beryllia of maximum density are shown. The fabrication of rocket nozzles according to the best procedures is described. A limited study of the machining of hot pressed beryllia is included.

James Forrestal Research Center, Princeton, N. J.
BIBLIOGRAPHY OF UNCLASSIFIED SQUID PUBLICATIONS. Supplement A, 1 June 56-1 June 57, to Ten Years of Project SQUID -- a Bibliography, Contract N6ori-105(03). Oct 57, 14p. 75 refs. Proj. Squid Technical rept. no. PR-67-P-A, Suppl. to Technical rept. no. PR-67-P; AD-146 062.
Order from LC mi$2.40, ph$3.30 PB 136 669

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
EQUATIONS OF MOTION OF A MISSILE AND A SATELLITE FOR AN OBLATE-SPHEROIDAL ROTATING EARTH, by B. E. Kalensher. Rept. on Contract DA 04-495-ORD-18. 12 Apr 57, 39p. 1 ref. Memo. no. 20-142.
Order from LC mi$3.00, ph$6.30 PB 139 901

The equations of motion of a rocket are derived by applying the fundamental definition of the derivative to Newton's second law of motion. Three independent cases are considered: motion of the missile center of mass, rotation of the missile about a transverse axis through the center of mass, and rotation of the missile about the longitudinal axis. The second case describes the motion in pitch (or yaw), and the third case describes the rotation (spin or roll) of the missile due to a ring of small jets placed around its circumference. The equations of motion of the center of mass are then modified to describe the motion of a satellite moving around the earth in a nearly circular orbit. Finally, a method is developed for computing the approximate impact point of the missile by algebraic means.

Naval Ordnance Test Station, China Lake, Calif.
THE EFFECT OF SEA-WATER SALTS ON PERFORMANCE OF A TURBINE FOR A RESEARCH TORPEDO CONFIGURATION, by Carl D. Runge and William H. Tyler. 4 Mar 57, 16p. 6 refs.
NOTS-1700; NAVORD rept. 5432.
Order from LC mi$2.40, ph$3.30 PB 138 180

In order to determine the proper inlet-gas temperature for torpedo turbine operation on propellants using sea water as a diluent, the effects of salt deposits on turbine performance as a function of working fluid temperatures were investigated. Sixteen turbine tests were conducted using the combustion products of diesel fuel, hydrogen peroxide and sea water to drive a 12-inch-diameter Terry turbine. Gas temperatures between 450 and 1935°F were attained by varying the sea-water flow. The fuel and oxidizer flows were constant. The results of these tests indicate that salt deposits from sea-water diluent affected the horsepower output of the Terry turbine. However, satisfactory operation of the turbine was achieved for inlet-gas temperatures above 1850°F and below 480°F.

Naval Ordnance Test Station, China Lake, Calif.
EQUILIBRIUM COMPOSITION AND THERMODYNAMIC PROPERTIES OF COMBUSTION GASES. PART 1. A SYSTEM FOR THE COMPUTATION OF GASEOUS PRODUCTS OF COMBUSTION, by William S. McEwan. 26 May 50, 31p. 5 refs. NOTS 289; NAVORD rept. 1229, pt. 1.
Order from LC mi$3.00, ph$6.30 PB 129 595

A system of computation, adapted to IBM equipment, has been devised for determining the relative amounts of O_2, O, H_2, H, H_2O, OH, CO, CO_2, N_2, and NO in the products of combustion at constant pressure. This system has been applied to fuels and oxidizer containing carbon, hydrogen, oxygen, and nitrogen. The principal advantages claimed for the system are that it is straightforward and requires no guessing or recourse to graphical methods by the operator and that it can be used without solving the problem completely to the determination of partial pressures to test for convergence.

Naval Ordnance Test Station, China Lake, Calif.
FIELD TEST OF FIRST PRODUCTION LOT OF NONPROPULSION ATTACHMENT FOR 5.0-INCH SPIN-STABILIZED ROCKETS, by D. Trewhella. 1 May 57, 19p. NOTS-1721; NAVORD rept. 5445; AD-133 439.
Order from LC mi$2.40, ph$3.30 PB 136 993

The Nonpropulsion Attachment NOTS Model 3H was given vibration, static- and field-firing tests. Static-firing tests were made under the most severe conditions allowed by Bureau of Ordnance drawing tolerances. Field-firing tests included: cross-ignition, strafing, and conflagration tests of rounds stored to simulate shipboard stowage.

Naval Research Lab., Washington, D. C.
RELATIVE RADIATION DENSITY AND TEMPERATURE DISTRIBUTION OF ROCKET FLAMES, by F. E. Wyman. 10 July 51, declassified 15 Dec 53. 22p. 4 refs. NRL rept. 3823.
Order from LC mi$2.70, ph$4.80 PB 129 140

This report discusses a method of determining relative radiation density and temperature distribution of rocket exhaust flames by photographic methods. Total radiant-energy data is obtained from a photographic negative and, by graphical differentiation and integration, is converted to relative radiation density. Temperature distribution is calculated upon the basis of an assumed temperature at a known position in the flame. Flame dimensions and node positions of several motor runs are presented for completeness.

Stanford Research Inst., Calif.
INVESTIGATION OF JET FLAMEHOLDERS. PART II, By A. W. Noon. Rept. on Ramjet Technology, Contract AF 33(616)2938. Apr 57 [27]p. 1 ref. WADC TN-56-316, Pt. 2; AD-118 325.
Order from OTS $0.75 PB 131 269

This report is a study of the effect of fluid jets in stabilizing combustion in a premixed stream. Parameters investigated in this period were jet temperature, jet composition (natural gas-air mixtures) at different temperatures, and stratification of the main stream. In tests using air as the jet fluid the effect of jet air temperature on stability limits was found to be important, with improved stability at the higher temperatures. Tests in which the combined effects of jet temperature and jet composition were studied show that the jet composition is of much greater importance to flameholding capacity. The possibility of using the injected jet stream as a combined fuel injector and flameholder was investigated. The effect of stratification of fuel in the main stream in the region of the flame holding jet was demonstrated by systematically closing ports of a ring-type fuel injector.

White Sands Proving Ground, N. Mex.
EVALUATION OF CORPORAL AND NIKE PROPELLANTS AND PROPELLANT CONTAINERS WITH REGARD TO STORAGE. PART 4, by James P. Hamill. June 57, 34p. 5 refs. Technical memo. 438.
Order from LC mi$3.00, ph$6.30 PB 135 534

Propellants used in guided missiles, i.e., inhibited red fuming nitric acid (IRFNA), corporal fuel, unsymmetrical dimethylhydrazine (UDMH), and Nike starting mix, have been stored in their normal storage containers under conditions simulating field and depot storage. The results of the fourth and fifth period of storage each of six months duration, are reported.

Manufacturing Equipment and Processes

Armour Research Foundation, Chicago, Ill.
FUNDAMENTALS OF BRAZING, by N. Bredzs and H. Schwartzbart. Annual rept. no. 5 (Final) for 23 June 56-23 June 57 on Contract DA 11-022-ORD-957. 2 Dec 57, 69p. 4 refs.
Order from LC mi$3.90, ph$10.80 PB 140 109

A new brazing apparatus has been developed and techniques further refined to permit a more precise determination of tensile strength-joint thickness relationships. Such curves were obtained for mild steel, drill rod and SAE 4340 bars brazed with BAg-8 (which is the eutectic Ag-Cu alloy), and various Cu-Fe-B alloys. Considerable effort was devoted to the development of Cu-Fe-B alloys, both copper base and iron base, as practical filler metals. Such alloys appear to be feasible as high-strength brazing alloys.

Armour Research Foundation, Chicago, Ill.
GRAPHITE TECHNOLOGY, by Samuel W. Bradstreet. Rept. on Contract AF 33(616)5185. Jan 59, 73p. 218 refs. WADC Technical rept. 58-503; AD-208 324.
Order from OTS $2.00 PB 151 682

Investigation of the influence of composition and processing variables on certain properties of small, molded multicrystalline graphite was undertaken. Of more than 50 binder materials coal-tar pitch, furfuryl alcohol, and phenol-benzaldehyde were judged to be most promising. Aggregates were limited to calcined petroleum coke flour and a thermal carbon additive. Of the properties measured, the most sensitive were found to be apparent (water immersion) density, electrical resistance, and dynamic flexural modulus; the last and fexural strength and thermal expansion were measured for several graphites to their creep threshold (2100-2500 C). Best reproducibility (95%) confidence level) was obtained with solvent mixing, vacuum pressing, and binder-poor mixes with rigid control of all processing variables.

Bureau of Yards and Docks, Washington, D. C.
SHEETMETAL, STRUCTURAL IRON AND WELDING BASIC SUPPORTING DATA. Engineered Performance Standards, Public Works Maintenance. Jan 58, 312p.
Order from LC mi$11.10, ph$48.60 PB 139 763

Bureau of Yards and Docks, Washington, D. C.
SHEETMETAL, STRUCTURAL IRON AND WELDING HANDBOOK. Engineered Performance Standards, Public Works Maintenance. Jan 58, 72p.
Order from LC mi$4.50, ph$12.30 PB 139 762

Carnegie Inst. of Tech., Graduate School of Industrial Administration, Pittsburgh, Pa.
FORECASTING SEASONALS AND TRENDS BY EXPONENTIALLY WEIGHTED MOVING AVERAGES, by Charles C. Holt. ONR Research memo. no. 52 on Planning and Control of Industrial Operations, Contract Nonr-760(01). 2 Apr 57, 11p.
Order from LC mi$2.40, ph$3.30 PB 136 108

A new value of the average is obtained merely by computing a weighted average of two variables, the value of the average from the last period and the current value of the variable. This paper utilizes these desirable properties both to smooth current random fluctuations and to revise continuously seasonal and trend adjustments.

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
DEPARTMENT OF DEFENSE TITANIUM SHEET ROLLING PROGRAM, by H. R. Ogden. Status rept. no. 4, 1 Jan-31 Dec 58, on [Contract AF 18(600)1375]. 20 Mar 59, 93p. 4 refs. DMIC rept. 46F; AD-211 437.
Order from OTS $2.25 PB 151 065

Summaries of progress made by each of the contractors in the program are given along with discussions of some of the important problem areas. At present, there are four alloys in the program (Ti-6Al-4V, Ti-4Al-3Mo-1V, Ti-2.5Al-16V, and the recently added Ti-13V-11Cr-3Al alloy). Three producers and eight aircraft companies are participating in the program. Phase I, the production of heat treatable sheet alloys, is nearing completion and all contractors in Phase III, evaluation of formability and properties, have started their evaluation programs. Phase II, development of design data, should be started by March, 1959.

Institute for Cooperative Research, John Hopkins U., Baltimore, Md.
STUDY OF THE STABILITY OF ARCS WITH TITANIUM ELECTRODES IN ARGON AND HELIUM, by T. Benjamin Jones and E. Howard Young. Technical rept. no. 2 on Fundamental Characteristics of Titanium Arcs in the Inert Gases, Contract DAI-36-034-505-ORD(P)-1. Sep 56, 38p. 5 refs. WAL-401/267-1.
Order from LC mi$3.00, ph$6.30 PB 135 325

The effects on cathode spot stability were determined for external fields of both magnetic and electric origin, special bare and coated electrodes, and for arcs supplied with d-c and a-c power. The most favorable results from a stabilization standpoint were found with electrodes coated with a special refractory mixture. These coatings consisted largely of TiO_2 and Rutile with a sodium silicate binder. The use of alternating current power for titanium arcs holds some promise for improvement in stability as compared to direct current power.

Massachusetts Inst. of Tech., Cambridge.
COLD EXTRUSION OF HIGH STRENGTH ALUMINUM ALLOYS, by Walter A. Backofen, Richard B. Palme, and Shillings Tsang. Final rept. on Contract DA 19-020-ORD-3454. 1 June 58, 126p. 31 refs.
Order from LC mi$6.30, ph$19.80 PB 140 112

A study of cold piercing was aluminum alloy 7075-0 as principal test material. A deformation analysis using both grids and microhardness surveys was made to establish the strain and hardness variations as functions of processing variables and to illustrate the alteration in flow during transition from steady to non-steady state. Generally superior mechanical properties are associated with pierced cups after the precipitation hardening T-6 heat treatment.

Metcut Research Associates, Inc., Cincinnati, Ohio.
MACHINING CHARACTERISTICS OF HIGH STRENGTH THERMAL RESISTANT MATERIALS,

Leonard J. Nowikowski. Interim engineering rept. no. 4, 1 Oct-31 Dec 58 on Subcontract to Contract AF 33(600)35967. 25 Jan 59, 132p. Wright Aeronautical serial rept. no. MP. 00-178.
Order from LC mi$6. 90, ph$21. 30 PB 140 083

A study of turning, milling, drilling, tapping and grinding has been conducted on AISI 4130, AISI 4340, 17-22 AS, Chromalloy, Vasco Jet 1000, Unimach 2, Peerless 56, Super Tricent, UHS-260, Halcomb 218, A-286, 410 Stainless, R-235, Udimet 500, Inconel 901 and Inconel 700. The data is presented to show the relationships between tool life, cutting speed, feed, tool geometry and tool material.

Metcut Research Associates, Inc., Cincinnati, Ohio.
MACHINING CHARACTERISTICS OF HIGH STRENGTH THERMAL RESISTANT MATERIALS. PHASE II. SURVEY OF CHEMICAL MILLING, by Norman Zlatin. Suppl. to Interim engineering rept. no. 4, 1 Sep 58-31 Jan 59 on Subcontract to Contract AF 33(600)35967. 23 Feb 59, 52p. 28 refs. Wright Aeronautical Serial rept. no. MP.00-178.
Order from LC mi$3.60, ph$9.30 PB 140 082

An analysis was made of the present state of the art of chemical milling from visits to major companies employing the process in the production of aircraft and missile parts, and from questionnaires and a literature search. The principal operations are pocketing, tapering and overall weight reduction. The chemical milling of the high strength thermal resistant alloys is in the experimental stage. (See also PB 140 083)

National Research Corp., Cambridge, Mass.
PREPARATION OF ALLOY FILLER MATERIALS FOR WELDING TITANIUM, by P. J. Clough. Final rept. on Contract DA 19-020-ORD-3023. 18 Oct 57, 19p. WAL 401/293.
Order from LC mi$2.40, ph$3.30 PB 138 471

Techniques which would permit the remelting of alloys without the introduction of excessive amounts of interstitial contaminants led to the construction and operation of a consumable electrode furnace. The alloys produced could be forged and rolled and were supplied as rolled sheet to the Watertown Arsenal for their evaluation as alloy filler materials for welding.

Naval Gun Factory, Washington, D. C.
SURVEY OF PROTECTIVE COATINGS FOR STEEL SPRINGS, by W. P. Barrows. Dec 57, 19p. 9 refs. Technical rept. no. NGF-T-40-57; NAVORD rept. no. 5524.
Order from LC mi$2. 40, ph$3. 30 PB 139 903

Typical reports describing the methods for alleviation or elimination of hydrogen embrittlement in high strength steels, including spring steel, are summarized. Incidence of hydrogen embrittlement of plated springs and suggested remedies or alternatives to plating of springs are presented.

Naval [Propellant Plant] Indian Head, Md.
AUTOMATIC CHEMICAL PLANT: A LITERATURE SURVEY OF AUTOMATION, by Mae I. Fauth. 26 Dec 56, 65p. 19 refs. Memo. rept. no. 126.
Order from LC mi$3. 90, ph$10. 80 PB 135 090

The information contained in this report was compiled for presentation to the JANAF Analytical Chemistry Panel as a summary of the kind of information, instruments, and components now available. Most of the material was taken from the descriptions and literature of the manufacturers of control devices and from the periodical literature of the last 2 years.

Naval Research Lab., Washington, D. C.
FACTORS AFFECTING THE PERFORMANCE OF MOLD AND CORE SAND BONDED WITH SODIUM SILICATES, by R. E. Morey and E. A. Lange. Final rept. 12 Mar 59, 11p. 1 ref. NRL rept. 5293.
Order from LC mi$2. 40, ph$3. 30 PB 138 474

The inherent characteristics of mold or core sands related to moldability, dimensional stability at high temperatures, and ease of shakeout have been investigated for sodium silicate bonded sand. The findings indicate that the proper selection of materials and processing techniques can result in high-quality castings. This selection of materials and techniques sometimes differs from conventional practices but involves the control of the same properties and characteristics inherent to any mold and core sand, including green strength, retained strength, metal penetration, gas evolution, and distortion. Data presented in the report will aid in the proper choice of materials and techniques, which include (a) the sodium silicate composition; (b) the amount of sodium silicate mixed with sand; (c) the CO_2 gassing time; (d) the additives, such as liquid sugar and other carbonaceous materials; and (e) the use of washes, vents, and reinforcement rods.

Naval Research Lab., Washington, D. C.
FOUNDRY CHARACTERISTICS OF Mn-V-Mo AGE-HARDENING AUSTENITIC STEEL, by N. C. Howells and E. A. Lange. 4 Mar 59, 12p. 5 refs. NRL rept. 5285.
Order from OTS $0. 50 PB 151 539

Successful founding of the new Mn-V-Mo age-hardenable austenitic steels depends upon the use of special techniques with regard to melting, pouring, mold materials, and heat treatment. A typical melting procedure includes piping dry argon gas into the crucible of the induction furnace and a carbon boil for minimizing the hydrogen content of the molten metal. In experiments, castings were poured at 2800°F, using a gating system with a choke at the sprue base, an enlarged runner bar, and an ingate entering the riser. This alloy appears to be more difficult to feed than low-alloy steel, and consequent precautions should be taken in choosing the gating and riser dimension. Because of the combination of high pouring temperature required by these steels, and their high manganese content, sand mixtures differing from conventional mixtures are required to prevent mold-metal reactions. Sand mixtures with a zircon sand base and containing 5% silica sand and 1% core oil as special

additives promote high-quality casting surfaces. Tensile properties of the metal can be controlled by the aging phase of the heat treatment; 145,000 psi ts, 110,000 psi ys, and 12% elongation were attained with an aging treatment of 8 hours at 1300°F.

Notre Dame U., Ind.
QUANTITATIVE DEFORMATION TEXTURES OF ALUMINUM, COPPER, SILVER, AND IRON WIRES, by August Freda and B. D. Cullity. Technical rept. no. 5 on Contract N7onr-439(05). [1958] 27p. 18 refs.
Order from LC mi$2.70, ph$4.80 PB 139 868

Quantitative measurements were made of the skin texture of aluminum and of the inside textures of aluminum, copper, silver, and iron by a new diffractometer method. In these textures <111> was the major component, except for one variety of copper.

Pennsylvania U. School of Metallurgical Engineering, Philadelphia.
QUENCHED-IN VACANCIES IN NOBLE METALS, by H. Kimura, R. Maddin, and D. Kuhlman-Wilsdorf. Technical rept. no. 3 on Contract Nonr-551(19). Jan 58, 41p. 6 refs.
Order from LC mi$3.30, ph$7.80 PB 138 437

Part 1. The kinetics of vacancy annealing
Part 2. Clustering of vacancies during quenching
Part 3. Application of the theory to experiment
Part 4. A short note on quench-hardening in noble metals

Picatinny Arsenal, Dover, N. J.
A MODERN DYNAMIC APPROACH TO PRODUCT DEVELOPMENT, by Sidney Sobelman. A study made under the auspices of a Secretary of the Army's Research and Study Fellowship Sep 56-Sep 58. Dec 58 [206]p. 145 refs.
Order from OTS $3.50 PB 151 649

Contents:
The problem -- statement and importance
Basic study concepts
The customer's needs (product characteristics)
Product pay-off (profit) and the time factor
Evaluation and selection of programs
Forecasting and scheduling a program
Forecasting and scheduling many programs (allocation of resources)
The milieu or "climate" for product development
The organization-characteristics and structure
Funds and the budget
The future

Pitman-Dunn Labs. Group, Frankford Arsenal, Philadelphia, Pa.
STUDY OF THE WELDABILITY OF ALUMINUM CASTING ALLOYS WITH 5086 WROUGHT ALUMINUM ALLOY, by M. S. Orysh and I. G. Betz. Sep 58 [56] p. Rept. R-1467.
Order from OTS $1.50 PB 151 307

Almag 35, Al-7% Mg, and 214 could be satisfactorily welded to the 5086 material. The joining of those casting/filler metal/5086 alloy combinations which contained both silicon and magnesium as major alloying elements was less likely to produce joints of reasonable strength and ductility due to the formation of magnesium silicide. Gross porosity was encountered in the weld when castings of the Al-7% Mg-3% Zn alloy were welded to 5086 alloy sheet.

Princeton U., N. J.
TESTING THE WORKABILITY OF INPUT-OUTPUT ANALYSIS, by Michio Hatanaka. Technical rept. on Economics Research Proj. 22 Apr 57, 83p. 38 refs.
Order from LC mi$4.80, ph$13.80 PB 136 568

This paper presents a statistical analysis of errors in the estimates of total outputs and indirect demands in input-output analysis. The purpose is to discern some of the directions toward which the present form of input-output analysis should be oriented to improve its workability. An important feature of the tests is that the input coefficients for the transportation and trade margin rows as well as the coefficients for the energy inputs in the transportation and service columns are excluded from the input-output model on the basis of the well known controversies over their constancy. The tests are divided into two parts: first, a test of the size of error and, second, a test of the consistency of error.

Purdue U. School of Industrial Engineering and Management, Lafayette, Ind.
DYADIC PROGRAMS AND SUB-DUAL METHODS, by A. Charnes, and W. W. Cooper and Merton Miller (Carnegie Inst. of Tech.). ONR Research memo. no. 21 on Methodological Aspects of Management Research and Planning and Control of Industrial Operations, Contracts Nonr-1100(05) and Nonr-760(01). Dec 57, 42p. 33 refs.
Order from LC mi$3.30, ph$7.80 PB 139 399

Rodman Lab., Watertown Arsenal, Mass.
CURRENT STATUS OF CEMENTED CARBIDE TECHNOLOGY, by William O. Woods. June 58 [37]p. 67 refs. Rept. no. RPL 40/2.
Order from OTS $1.00 PB 151 302

Contents:
Introduction:
Statement of problem
Historical Summary:
Discovery of tungsten carbide
Basic patent contributions
Technological Development:
Carbide formers of importance
Binder metals
Research accomplishments
Theories of cementing mechanism
Properties of cemented carbides
Processing and Testing Methods:
Processing
  Powder preparation
  Pressing and forming
  Firing and sintering
  Hot pressing
Laboratory tests
Industrial tests

Hardness
Density
Transverse rupture strength
Metallographic examination
Sample preparation
Porosity
Microstructure
Applications:
Industrial
Tools
Surface
General
Military
Conclusions:
Multiplicity of grades
Lack of technical information

Rodman Lab., Watertown Arsenal, Mass.
EVALUATION OF RAPID GAS HEATING TECHNIQUES FOR CYLINDRICAL COMPONENTS, by A. M. Ayvazian and S. Valencia. 29p. Technical rept. no. RPL 32/3.
Order from LC mi$2.70, ph$4.80 PB 137 499

Mechanical properties of cylinders treated by the rapid heating method were comparable to those of cylinders heat treated by conventional methods. Reduction of time possible with the rapid heating technique and consequently lower fuel consumption represent savings for heat treatment of such shapes.

Rodman Lab., Watertown Arsenal, Mass.
LINEAR PROGRAMMING APPLIED TO A FOUNDRY COST PROBLEM, by Gideon I. Gartner. Dec 58, 19p. 8 refs. Rept. no. RPL 10/16.
Order from LC mi$2.40, ph$3.30 PB 138 507

The Linear Programming technique can be used to choose that feasible material combination whose material cost is a minimum. The technique can be used to calculate optimum prescriptions for individual heats, or to determine which materials to buy to stock in inventory.

Transport, Traction and Hoist Facilities

American Machine and Foundry Co., Chicago, Ill.
DYNAMIC MODES OF TRANSPORTATION STUDY, by E. A. Brunauer. Final rept. on Contract AF 30(635)2903. Oct 56, 61p. MR 1032; RADC-TR-57-16; AD-114 245.
Order from LC mi$3.90, ph$10.80 PB 135 388

The investigation was concerned with the vibration and shock environments to which Air Force Ground Electronic Equipment is subjected in transit by land, sea, and air. In particular, the project objective was to determine the technical and economic feasibility of a simulator which would be capable of reproducing such shock and vibration environments in the laboratory. The emphasis in these studies was placed on the simulation of field transit in trucks.

Army Transportation Research and Engineering Command, Fort Eustis, Va.
DOLLY TRAILER CONVERTER AND SEMITRAILER, by John E. Thomas and John H. Hansen. Sep 58, 30p. Final rept. on Proj. 9-47-16-000, Test MT-17 (formerly Proj. 9-97-40-000, Task 5, 16) AD-148 494.
Order from LC mi$2.70, ph$4.80 PB 140 261

This report covers the investigation and testing necessary to determine the mechanical and operational compatibility of dolly trailer converters with semitrailers. The dolly trailer converter is used to convert a semitrailer into a full trailer. This permits it to be towed in tandem with a truck tractor-semitrailer combination. The determinations included stopping distances, ease of maintenance, and operational compatibility over rough terrain and over improved and semi-improved highways. It was found that with minor modifications of the semitrailers, it is feasible to tow a semitrailer converted to a full trailer in tandem with a truck tractor semitrailer combination.

Army Transportation Research and Engineering Command, Fort Eustis, Va.
LOCOMOTIVE, DIESEL ELECTRIC, 36-, 39-3/8-, AND 42-INCH GAGE, 48-TON, 0-4-4-0 WHEEL, DOMESTIC AND FOREIGN SERVICE, Part II, by Karre J. Loftheim and D. M. Cawthon. Final rept. pt. 2 on Contract DA 44-177-tc-61. Mar 58, 63p. Proj. 9-56-04-000, Subtask 302R, pt. 2; AD-120 519.
Order from LC mi$3.90, ph$10.80 PB 135 629

A locomotive of suitable power, speed, and flexibility was developed for light-duty switching and road service in both domestic and foreign theaters of operation. The total weight of the narrow-gage prototype, fully loaded locomotive was 56.7 tons. With the possible exception of the temperature characteristic, the locomotive met all other specified military characteristics. Because of its failure to meet the weight requirement, the narrow-gage diesel-electric locomotive was not satisfactory for adoption as a Transportation Corps standard item. (See also PB 135 641)

Army Transportation Research and Engineering Command, Fort Eustis, Va.
LOCOMOTIVE, DIESEL-ELECTRIC, 56-1/2-, 60-, 63-, AND 66-INCH-GAGE, 48-TON, 0-4-4-0 WHEEL, DOMESTIC AND FOREIGN SERVICE, by Kaare J. Loftheim. Final rept. pt. 1 on Contract DA 44-177-tc-61. Dec 57, 85p. Proj. 9-56-04-000, subtask 302R, pt. 1; AD-120 514.
Order from LC mi$4.80, ph$13.80 PB 135 641

The design, construction, and testing of a broad-gage, USA-4000 locomotive are discussed. Work was initiated to meet the transportation corps requirement for highly versatile locomotives of suitable power, speed, and flexibility for light-duty switching and road service in both domestic and foreign theaters of operation. The most difficult requirement was to meet the specified 50-ton weight. With maximum weight reduction in underframe sections, superstructure, and components, the total weight of the fully loaded locomotive was 60 tons (US). Break-in

and service tests were conducted on the Northwestern and Great Northern railroads. Test results indicated that the locomotive was satisfactory for light-duty switching and road service in both single- and multiple-unit operation in temperatures as low as -29° F. Requirements are met except those pertaining to weight and to cold-weather operation.

Brown U. Div. of Applied Mathematics, Providence, R. I.
FIXED CHARGE PROBLEMS OF TRANSPORTATION TYPE, by Te Chiang Hu. Technical rept. no. 3 on Contract Nonr-562(15). June 58, 11p. 6 refs.
Order from LC mi$2.40, ph$3.30 PB 139 894

In recent years, many seemingly unrelated problems of economical planning have been recognized as special forms or slight modifications of Hitchcock's transportation problem. In its original form, this problem concerns a homogeneous product that is produced in specified amounts P_i ($i = 1, 2, \ldots, m$) at m plants and required in specified amounts O_j ($j = 1, 2, \ldots, n$) at n markets, the total amount produced equaling the total amount required. The cost C_{ij} of shipping an amount $x_{ij} \geq 0$ from the plant i to the market j is supposed to be given by

$$C_{ij} = c_{ij}x_{ij},$$

where the "specific shipping cost" c_{ij} is a known characteristic constant of the "route" i, j. A shipping program that minimizes the total shipping cost is to be determined.

Naval Civil Engineering Lab., Port Hueneme, Calif.
DEVELOPMENT OF 21-FT WIDE END-TO-END CONNECTED NL PONTOON CAUSEWAY, by R. C. Towne. Final rept. 20 Mar 59, 24p. 8 refs. Technical rept. R-022; AD-205 595.
Order from LC mi$2.70, ph$4.80 PB 140 032

The report describes the development of the causeway, initial in-service evaluation, and results of a landing exercise conducted with the causeway near Camp Pendleton, California, in September 1958. The subject causeway successfully completed the engineering tests made at the Laboratory and performed satisfactorily with minor exceptions during the in-service evaluation.

Naval Civil Engineering Lab., Port Hueneme, Calif.
LST MULTIPLE PILE DRIVING RIG (BARGE MOUNTED), by J. J. Hromadik and R. C. Towne. Final rept. 2 Feb 59, 27p. 2 refs. Technical rept. R-015.
Order from LC mi$2.70, ph$4.80 PB 140 030

Engineering evaluation test procedure and results described. Results indicate that (1) the present design is structurally and mechanically inadequate, and (2) the present multiple pile driving concept is not feasible due to inability to moor the barge satisfactorily for pile driving operations.

Naval Civil Engineering Lab., Port Hueneme, Calif.
POLAR BASE TRANSPORTATION AND MATERIAL HANDLING EQUIPMENT; PORTABLE LOADING PLATFORM, by James B. Camm. Final rept. 10 Mar 59, 25p. 6 refs. Technical rept. R-018; AD-205 592.
Order from LC mi$2.70, ph$4.80 PB 140 031

The platform developed under this subproject meets the requirements both for aircraft loading and unloading and for use as a general material-handling aid with other transportation equipment at forward areas. It is structurally adequate for three-ton loads and it has good erection characteristics. The platform is considered acceptable for adoption as a logistic support item in the polar base transportation and material-handling equipment field.

Purdue U. School of Industrial Engineering and Management, Lafayette, Ind.
TRANSPORTATION SYSTEMS RESEARCH II: CYCLIC SCHEDULING AND COMBINATORIAL TOPOLOGY; ASSIGNMENT AND ROUTING OF MOTIVE POWER TO MEET SCHEDULING AND MAINTENANCE REQUIREMENTS, by V. B. Gleaves (St. Louis-San Francisco Railway Co.), T. E. Bartlett, and A. Charnes. ONR Research memo. no. 10 on New Methods of Analysis of Rail Transportation, Methodological Aspects of Management Research, Contract Nonr-1100(05). Apr 57, 35p. 5 refs.
Order from LC mi$3.00, ph$6.30 PB 137 651

The use of the incidence matrix and the related computational devices indicated permits us to solve essentially the problem which was presented by the Frisco Railroad. As is to be expected from such a model, the analysis has uncovered many interesting features which were not obvious at the start. Additional analysis is currently under way which should lead to an even more useful model which may have much wider application.

MATERIALS

Rock Island Arsenal Lab., Ill.
HIGH STRENGTH CELLULOSTIC MATERIALS THROUGH INTERNAL POLYMERIZATION, by Evelyn S. Burke. 9 Jan 59, 20p. 22 refs. Technical rept. no. 59-77.
Order from LC mi$2.40, ph$3.30 PB 140 265

Internal polymerization of acrylonitrile in filter paper was accomplished using gamma radiation as well as chemical catalysts. When pure acrylonitrile is so polymerized, a 100% increase in dry tensile strength of the paper results with 50% wet strength retention. Although increases in wet strength result from internal polymerizations taking place in aqueous media, such results are accompanied by a substantial loss of dry tensile strength due to the action of water on the paper. Lack of dissolution of treated paper in cuprietylenediamine after extraction with dimethylformamide indicates that the treatment results in an intimate mixture of polyacrylonitrile and cellulose or that a graft polymer is formed.

Adhesives and Sealants

Material Lab., New York Naval Shipyard, Brooklyn.
USE OF ORLON FELT IN GLASS REINFORCED POLYESTER LAMINATES. Evaluation rept.
2 July 58 [11 p. Lab. proj. 5638-13, Final rept.
Order from OTS $0.50 PB 151 297

The Material Laboratory has conducted an investigation of the effects of employing an Orlon felt material as a surface overlay in a glass reinforced polyester laminate fabricated by a void-free vacuum bag technique. Compared with a similarly fabricated laminate without Orlon felt, the laminate has been found to possess high impact-porosity resistance and abrasion resistance, and low physical property values. Working of the laminate, in the fabrication process, resulted in "washing" or loosening of the Orlon fibers, so that a non-uniform surface was produced.

Occidental Coll., Los Angeles, Calif.
THE INVESTIGATION OF THE NATURE OF THE FORCES OF ADHESION, by L. Reed Brantley and Fred Weiler. Technical rept. for 1 July 57-30 June 58 on Contract N9onr-867(01). [1958] 30p. 10 refs.
Order from LC mi$2.70, ph$4.80 PB 139 866

Adsorption isotherms are reported for ethylene dichloride vapor, and for water vapor on the gamma form of anhydrous aluminum oxide and on the alpha trihydrate of aluminum and their significance discussed. The adsorption isotherms for three typical vinyl resins are also reported. The lowest adsorption on alumina from ethylene dichloride was found to take place with the VYHH vinyl type which also produced the poorest adhesion. The effect of alcohols, such as butanol, on the adsorption of ethylcellulose from solution is demonstrated with alumina. (See also PB 139 867)

Occidental Coll., Los Angeles, Calif.
THE INVESTIGATION OF THE NATURE OF THE FORCES OF ADHESION, by L. Reed Brantley and Merilyn Eakin. Technical rept. for 1 July 56-30 June 57 on Contract N9onr-867(01). [1957] 38p. 7 refs.
Order from LC mi$3.00, ph$6.30 PB 139 867

A critical review of the method of measurement of adhesion and its interpretation with the Adherometer and certain related instruments is given. Analysis of data and basic theory from other fields is applied to the Adherometer. The concept of reporting adhesion, obtained by destructive test methods, as work or energy of removal, rather than force of adhesion, is proposed. Investigation of Adherometer adhesion of a variety of typical organic coatings is reported and comparison of the results is made with coatings previously tested.

Occidental Coll., Los Angeles, Calif.
THE INVESTIGATION OF THE NATURE OF THE FORCES OF ADHESION, by L. Reed Brantley, Final rept. for 1 July 57-30 June 58 on Contract N9onr-867(01). [1958] 28p. 14 refs.
Order from LC mi$2.70, ph$4.80 PB 139 896

The results of the nine year program for the investigation of adhesion are reviewed, and in some cases re-evaluated in accord with later developments. The reasons are discussed for the evaluation of the adhesion of organic coatings by the Adherometer in terms of work of "hesion," the work of removal of unit volume of a coating from a solid surface. The effect of environmental test conditions such as drying time, temperature, and speed of stripping are treated. For certain nitrocellulose, ethylcellulose, and vinychloride-acetate copolymer coatings, the effect of plasticizer, solvent, and pigments composition is reviewed. The surface chemistry of aluminum oxide, the substrate of an aluminum surface, is discussed from adsorption isotherm data for selected film formers, solvents, and other lacquer ingredients. (See also PB 139 866)

Ceramics and Refractories

American Electro Metal Div., Firth Sterling, Inc., Yonkers, N. Y.
CEMENTED METAL BORIDES. Final summary rept. for 1 Sep 56-31 Dec 57 on Contract Nonr-2218(00). 1 Mar 58, 61p.
Order from LC mi$3.30, ph$10.80 PB 139 415

Work started with an attempt to improve the impact strength of the otherwise quite satisfactory high temperature material Borolite IV (Cr_2B + Cr/Mo alloy, essentially by purification. Most of the hard metals tested showed a rise in strength as the test temperature was increased, with a peak strength in the range of 800-1200°C. Work on rare borides was extended. No significant improvement in impact strength or change in microstructure was found in purifying or vacuum sintering Borolite IV compositions.

American Electro Metal Div., Firth Sterling, Inc., Yonkers, N. Y.
AN INVESTIGATION OF THE MECHANICAL PROPERTIES OF CERMETS AS RELATED TO THE MICROSTRUCTURE, by Ira Binder and Robert Steinitz. Rept. for 1 Mar 57-30 Apr 58 on Ceramic and Cermet Materials, Contract AF 33(616)5084. Jan 59, 95p. 6 refs. WADC Technical rept. 58-432; AD-208 148.
Order from OTS $2.25 PB 151 722

A summary of cermet literature, especially that pertaining to microstructure, was made. Using 60 TiC - 40 Ni as the test material, seven different test groups were formulated, comprising changes in original particle size, processing procedure, and controlled binder addition. Each test group was heated in seven different fashions. Each test batch so obtained was tested for physical properties and its microstructure was investigated. The microstructures were correlated with changes in physical properties.

Carborundum Co. [Niagara Falls, N. Y.]
DEVELOPMENT OF ULTRA REFRACTORY MATERIALS, by Carl F. Cline and Gordon Lewis. Final rept. for 1 Aug 56-31 July 57 on Contract NOrd-17175. 19 Aug 57, 21p. 6 refs.
Order from LC mi$2.70, ph$4.80 PB 140 177

The system HfO_2-ThO_2-MgO has been investigated for temperatures of apparent melting and phases present at 1600°C. The stabilization of ZrO_2 and HfO_2 has been investigated using selected carbides, nitrides, borides, and sub-oxides; and it has been shown that a cubic phase of ZrO_2 and HfO_2 results. Refractory analogues of zircon have been prepared using HfO_2 and ThO_2 to replace ZrO_2. Hafnium silicate has exhibited unusually good resistance to severe thermal shock.

Carborundum Co. [Niagara Falls, N. Y.]
DEVELOPMENT OF ULTRA REFRACTORY MATERIALS, by Peter T. B. Shaffer. Final rept. for 1 Aug 57-31 Oct 58 on Contract NOrd-17175. 15 Nov 58 15 Nov 58, 24p. 12 refs.
Order from LC mi$2.70, ph$4.80 PB 140 171

A furnace for measuring modulus of rupture at temperatures up to 3630°F. (2000°C.) has been designed and assembled. Zirconia and hafnia have been stabilized in the cubic form by additions of the following materials: ZrC, ZrN, TiN, TiO, TiC, ZrB_2, $ZrSi_2$, TiB_2, $MoSi_2$, or Ta_2O_5. Synthesis procedures for pure zircon and hafnon have been developed. A hot-pressed body of 75% zircon - 25% zirconium diboride has been made and found to have a very low thermal expansion coefficient (3.58×10^{-6} cm./cm./°C.) as well as good room temperature strength (11,000 psi.). Such a body withstood 30 thermal shock cycles from 2550°F. (1400°C.) to room temperature without failure.

Carborundum Co., Niagara Falls, N. Y.
REFRACTORY BODIES INCLUDING BODIES CONTAINING BORON NITRIDE, by K. M. Taylor and K. C. Nicholson. Final rept. for 8 Aug 51-8 Oct 52 on Contract NOrd 12093. 11 Nov 52, 20p.
Order from LC mi$2.40, ph$3.30 PB 140 170

Test cylinders (6-5/8 inches O.D. x 6-1/8 inches I.D. x 4 inches long) representing nineteen refractory ceramic compositions were made and mounted in flanged steel casings for firing tests. These bodies include hot pressed titanium boride and boron nitride, several sintered bodies containing boron nitride and a variety of better known compositions.

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta, Ga.
INVESTIGATION OF HIGH TEMPERATURE RESISTANT MATERIALS, by J. D. Walton, N. E. Poulos, and C. R. Mason. Summary rept. no. 1 for 15 Mar 55-31 Oct 57 on Contract NOrd-15701. [1957] 213p. 8 refs.
Order from LC mi$9.60, ph$33.30 PB 139 926

Initial work was devoted to coating 1/16-inch molybdenum-sheet substrates with aluminum, gold, nickel, platinum, rhodium and silicon, respectively, as single films by evaporation, sputtering or electroplating. Film thicknesses in general were in the region 0.000015 to 0.000025 inch. A mixture of 3.5 parts of four parts aluminum and one part vanadium pentoxide with three parts silica gave a desirably rapid and high temperature reaction, producing fused coats. Experiments with exothermic, thermitic type coatings for metals pointed to the possibility that these coating materials might have use as structural materials. The mixes included oxides of chromium, cobalt, iron, manganese, molybdenum, nickel, silicon, titanium, vanadium and zirconium. A combination of 75-per-cent zirconium silicate and 325-mesh aluminum powder plus 25-per-cent alumina, gave a matrix of most desirable texture and mechanical properties. Substitution of kaolin for the alumina gave further improvements in texture and strength.

Illinois U., Urbana.
DESIGN AND DEVELOPMENT OF REFRACTORY CERAMIC LINING FOR COMBUSTION CHAMBER OF UNCOOLED ROCKET MOTOR, by Dwight G. Bennett and Robert F. Kimpel. Rept. no. 43 on Contract W33-038-ac-14520 (16071). Aug 49, declassified 6 Dec 55. 12p. 2 refs. AF Technical rept. no. 6072; ATI-67 678.
Order from LC mi$2.40, ph$3.30 PB 140 004

The design of a thermal shock-resistant ZrO_2 tile for a segmented rocket-engine combustion-chamber liner may make possible the use of zirconia, which has high insulating value but poor thermal shock resistance, as a rocket-engine lining.

Illinois U., Urbana.
FUNDAMENTAL STUDY OF CERAMIC COATINGS AND THEIR EFFECT ON STRUCTURE OF UNDERLYING METAL, by Dwight W. Bennett and Robert G. Hicks. Rept. no. 46 on Contract W33-038-ac-14520 (16071). Sep 49, declassified 6 Dec 55, 13p. 2 refs. AF Technical rept. no. 6075; ATI-67 677.
Order from LC mi$2.40, ph$3.30 PB 139 983

Steps in the preparation and heating of the specimens were scaling, sandblasting, ceramic coat application, and heating from 10 to 40 hours at 1600°F. X-ray diffraction patterns taken after each step showed that the coatings were effective in preventing the structural change which occurs in unprotected metal.

North Carolina State College, Raleigh.
ELECTRICAL CONDUCTIVITY AND DIELECTRIC PROPERTIES OF CERAMIC MATERIALS WITH THE PEROVSKITE STRUCTURE, AND SOLID STATE REACTION STUDY IN THE PEROVSKITE SYSTEM, BARIUM STRONTIUM TITANATE AND BARIUM STRONTIUM ZIRCONATE, by Roy B. Moffitt. Technical rept. for 17 Nov 57-31 Mar 58 on Contract Nonr-486(02). 15 June 58, 63p. 9 refs.
Order from LC mi$3.90, ph$10.80 PB 140 115

Procedure and pilot plant equipment design for the production of barium titanate of the highest possible purity from commercially available materials involves production of barium titanyl oxalate tetrahydrate and its subsequent calcination to barium titanate. The purity of the pilot plant material was found to be significantly higher than that of the commercial materials.

Northrop Aircraft, Inc., Hawthorne, Calif.
STABILITY OF MOLYBDENUM CARBIDE IN HYDRO-

GEN AT ELEVATED TEMPERATURES, by L. A. Ohlinger. Rept. on Stability of Refractory Elements and Compounds in a Hydrogen Atmosphere at Elevated Temperatures. July 48, declassified 25 Nov 57. 17p. NEPA 675-NOR-43; Rept. no. NRR-155; AD-146 567.
Order from LC mi$2.40, ph$3.30 PB 135 682

Molybdenum carbide is a desirable and stable refractory for either short term or long term service in hydrogen at temperatures below about 2000°C. In addition, it is not unreasonable to believe that this material might be used at temperatures up to 2100 - 2200°C. without reservation for short term service or with limitations for longer service periods. It probably would be unsafe to use this material for any service at temperatures above 2200°C.

Northrop Aircraft, Inc., Hawthorne, Calif.
STABILITY OF TITANIUM CARBIDE IN HYDROGEN AT ELEVATED TEMPERATURES, by L. A. Ohlinger. Rept. on Stability of Refractory Elements and Compounds in a Hydrogen Atmosphere at Elevated Temperatures. Aug 48, declassified 22 Nov 57. 30p. NEPA 735-NOR-51; Rept. no. NRR-162; AD-146 560.
Order from LC mi$2.70, ph$4.80 PB 135 661

It appears that titanium carbide is certainly stable in hydrogen at temperatures below 2000°C. and probably sufficiently stable for most purposes in hydrogen at temperatures up to 2400°C. However, above 2400°C., this material is not recommended unless dimensional instability, recrystallization and grain growth, and embrittlement are not significant factors. In this case, this material might safely be used to temperatures of 2700°C. in the presence of carbon or to temperatures even higher if there is no carbon in the atmosphere or in proximity to the TiC. The tests were conducted in an atmosphere of carbon so that the top limiting temperature under carbon-free conditions can only be conjectured as some temperature below 3000°C. in view of the reported melting point of 3137 ± 90°C.

Ohio State U. Research Foundation, Columbus.
SLIP-CASTING OF CHROMIUM-ALUMINA CERMET [BODIES] by Richard D. McKeen, G. A. Bole and others. Rept. on Ceramic Materials for Application in The Design of Jet-Propelled Mechanisms, Contract W33-038-ac-14217. 1 July 49, declassified 6 Jan 56. 16p. 2 refs. AF Technical rept. no. 6055; ATI-74 871.
Order from LC mi$2.40, ph$3.30 PB 139 984

Chromium-alumina cermet bodies containing metallic impurities can be formed by pressure casting, drain casting, and gravity casting. Thixotropic properties encountered in the cast specimen necessitated leaving the specimens in the molds until nearly dried.

Pennsylvania State [U. Coll.] of Mineral Industries [University Park]
INVESTIGATION OF REFRACTORY MATERIALS, by Herbert A. McKinstry, Clifford F. Hocker and others. Memo. rept. no. 20 on Contract W33-039-ac-16374. Feb 50, declassified 6 Dec 55. 67p. 12 refs. AFTR-6053; ATI-67 891.
Order from LC mi$3.90, ph$10.80 PB 139 982

Physico-chemical properties and crystalline stability of several two-component oxide and carbide systems include Al_2O_3-SiO_2; ZrO_2-SiO_2; MgO-TiO_2; Al_2O_3-TiO_2; TiO_2ZrO_2; Cr_3C_2-Al_4C_3; and the three-component system SiO_2-C-SiC. Thermal dissociation characteristics, thermal expansion curves, X-ray diffraction data, and physical properties are presented for various Al_2O_3-TiO_2 bodies.

Perkin-Elmer Corp., Norwalk, Conn.
THE DEVELOPMENT OF METHODS FOR LARGE-SCALE PRODUCTION OF ASPHERICAL OPTICAL ELEMENTS, by Joseph Vrabel. Rept. on Methods of Forming Complex Optical Surfaces, Contract AF 33(616)2111. June 54, 41p. WADC Technical rept. 54-281; AD-84 557.
Order from LC mi$3.30, ph$7.80 PB 140 096

An investigation was made to determine which of the following techniques offer possibilities for mass producing asperical surfaces: (1) ring tools mounted on spring ends on sponge-backed glass or ceramic facets; (2) relieved laps; (3) contour grinding; (4) formed tools; (5) ultrasonic grinding; (6) impact grinding; and (7) the Meinel process. Of these, the Meinel process appeared the most promising. This method consists of hogging out a glass blank by modified curve generator to a curve roughly approximating the desired figure, rough grinding the surface to a closer approximation with an accurately made cast iron lap, fine grinding with a membrane lap, and polishing. Aspects of the polishing procedure are described.

Powder Metallurgy Lab., Rensselaer Polytechnic Inst., Troy, N. Y.
RESISTANCE SINTERING OF REFRACTORY MATERIALS, by F. V. Lenel. Final rept. on Contract NOas 51-005c. Aug 52, 78p. 7 refs.
Order from LC mi$4.50, ph$12.30 PB 139 974

Cermets resistance sintered from a mixture of the commercial molybdenum disilicide powder and of nickel powder have good oxidation and fairly good thermal shock resistance. These cermets may be suitable for a coating material to protect metallic molybdenum.

Fuels, Lubricants, and Hydraulic Fluids

Aerojet-General Corp., Azusa, Calif.
STEADY-STATE PROPERTIES OF A SIMPLIFIED MODEL OF SOLID-PROPELLANT BURNING, by Leon Green, Jr. TN-12 on Contract AF 18(600)1048. Sep 55, 21p. 6 refs. AFOSR TN-55-334.
Order from LC mi$2.70, ph$4.80 PB 140 356

A model of solid-propellant burning is postulated, in which the complex chemical-reaction and heat-conduction problem in the gas phase is replaced by a simplified boundary condition which assumes convective heat transfer to the surface from a parallel

flow of gas at flame temperature. The effective heat-transfer coefficient is assumed to be an inverse function of propellant burning rate, which in turn is assumed to be an Arrhenius function of the surface temperature. The model permits calculation of steady-state surface temperatures, burning rates, and temperature gradients which show the proper qualitative dependence upon the propellant and gas-flow parameters which, for the assumed values of these parameters, appear to be of the proper order of magnitude.

Air Force Flight Test Center, Edwards AFB, Calif.
NORMAL PROPYL NITRATE STORAGE TEST, by Norman J. Vanderhyde. Feb 56, declassified 10 Aug 56, 45p. AFFTC-TN-56-12; AD-92 050.
Order from LC mi$3.00, ph$6.30 PB 139 902

This test was conducted to determine the storage characteristics of normal propyl nitrate under field conditions. Chemical and physical analysis accomplished periodically throughout the test duration of one year showed the plain steel drums without internal coating to be adequate for field storage. The analysis data also pointed out that steel drums contaminated with water will be severely corroded but will not contaminate the normal propyl nitrate.

Army Transportation Research and Engineering Command, Fort Eustis, Va.
ROLLING FLUID TRANSPORTER (INTERNAL TEMPERATURE AND PRESSURE BUILD-UP), by Briscoe B. Brown, Jr. and John Mapes. Interim rept. no. 2, May 58, 10p. Proj. 9-47-16-000, Test MT-8.
Order from LC mi$1.80, ph$1.80 PB 135 307

This report covers tests to determine whether internal pressure build-up in a rolling fluid transporter is sufficient to cause a rupture of the container and whether the air and fuel vapor mixture will cause a chemical explosion. Tests were conducted with the transporter rolling and stationary. For both the rolling and the stationary tests, the transporter was filled first with 5 gallons of fuel and then with 500 gallons. Results of the tests indicate that, for the operating conditions under which test were conducted, no hazard exists either from pressure rupture of the container or from a chemical explosion.

Atlantic Research Corp., Alexandria, Va.
THE MECHANISM OF DEFLAGRATION OF PURE AMMONIUM PERCHLORATE, by Raymond Friedman, Joseph B. Levy, and Keith E. Rumbel. Rept. on Contract AF 18(600)1502. 5 Feb 59, 36p. 12 refs. AFOSR-TN-59-173; AD-211 313.
Order from LC mi$3.00, ph$6.30 PB 139 991

Results of new deflagration experiments with ammonium perchlorate, both pure and catalyzed, have been presented. These include studies of rates of deflagration, pressure limits of deflagration, surface temperature, and effects of incident radiation on deflagration. These and previous results have been interpreted in terms of a tentative qualitative model of the deflagration process.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
CORROSION OF METAL RODS BY THE PRODUCTS OF COMBUSTION OF PERCHLORATE PROPELLANT, by Robert W. Geene. Sep 55, 9p. Memo. rept. no. 928.
Order from LC mi$1.80, ph$1.80 PB 139 929

An experiment was conducted on the corrosion of metal samples exposed to the products of combustion of highly perchlorated propellants. Metal samples studied were steels 4140, 4340, and 6150, stainless steel types 303 and 440; Hastalloy B; Inconel; nickel; and tantalum. All of the samples which indicated favorable resistance to the attack by the products of combustion, with the exception of tantalum, had a high nickel content, and little or no chromium.

Bureau of Mines, Washington, D. C.
FISCHER-TROPSCH SYNTHESIS IN A FLUIDIZED-CATALYST REACTOR WITH A NITRIDED, FUSED-IRON CATALYST, by J. J. Demeter and M. D. Schlesinger. 1959, 20p. 11 refs. Rept. of Investigations 5456.
Order from LC mi$2.40, ph$3.30 PB 139 861

A nitrided fused-iron group of catalysts developed in the Bureau has shown advantages over older iron catalysts. This is discussed in more detail through actual test data.

Denver and Rio Grande Western Railroad Co.
INVESTIGATION TO DETERMINE EFFECTS OF RADIATION ON FUELS. Progress rept. no. 4, July-Aug 58, on Contract DA 23-072-ORD-1245. [1958] 3p.
Order from LC mi$1.80, ph$1.80 PB 140 180

Denver Research Inst., Colo.
DEVELOPMENT OF SCHEMATIC ANALYTICAL PROCEDURES FOR SYNTHETIC LUBRICANTS AND THEIR ADDITIVES. PART IV. LABORATORY MANUAL FOR THE ANALYSIS OF SYNTHETIC LUBRICANTS, GREASES AND THEIR ADDITIVES, by Francis S. Bonomo and Joseph J. E. Schmidt. Rept. for July 53-Nov 56 on Contracts AF 33(616)2204 and AF 33(616)3336. July 57, 297p. WADC Technical rept. 54-464, Pt. 4; AD-130 922.
Order from OTS $6.00 PB 131 414

The manual is divided into five major sections: (1) Preliminary qualitative examination of the lubricant or grease, including solubility, elemental analysis, identification of grease type, and behavior of the lubricant (or base-oil from a grease) upon adsorption on a column of silica gel. (2) Qualitative detection and quantitative determination of antioxidants. (3) Qualitative detection and quantitative determination of corrosion preventive compounds. (4) Separation and quantitative determination of gelling agents and thickeners. (5) Separation, identification, and determination of base-oils from lubricants and greases.

Haller, Raymond, and Brown, Inc., State College, Pa.
LITERATURE SURVEY OF COMBUSTION FLAMES,

by C. L. Woodbridge, H. D. Rix, and G. K. Krother. Final rept. on Contract AF 19(604)1885. 30 Apr 57, 376p. 500 refs. 98-F, v. 1; AFCRC TR-57-180; AD-117 102.
Order from OTS $5.00 PB 151 237

This report is a literature survey of the fundamental research on the subject of combustion flames; it contains unclassified information on the combustion of gases, liquids, and solid propellants and the radiation characteristics of flames.

Inland Testing Labs. Div., Cook Electric Co., Morton Grove, Ill.
THE BEHAVIOR OF FUELS AND LUBRICANTS IN DYNAMIC TEST EQUIPMENT OPERATING IN THE PRESENCE OF GAMMA RADIATION, by M. Z. Fainman, M. E. Krasnow and others. Rept. for 1 Oct 56-31 Mar 58 on Chemical Propulsion Subsystems, Contract AF 33(616)3865. 31 Mar 58, 198p. 28 refs. WADC Technical rept. 58-264; AD-155 596.
Order from OTS $3.00 PB 151 701

This report summarizes work conducted on a program designed to evaluate fuels, hydraulic fluids, and lubricants for use in nuclear-powered aircraft. During the performance period ending March 1958, 79 fuels and 41 lubricants were investigated.

Irvine, Vess E., and Co., Inc., Bronx, N. Y.
PORTABLE FUEL TANKS, by V. E. Irvine. Final rept. on Contract DA 19-129-qm-684. 22 July 57, 26p.
Order from LC mi$2.70, ph$4.80 PB 135 316

Research on various properties of Magnesium and Aluminum; (2) Design of tanks in accordance with weight and space limitations; (3) Fabrication of aluminum tanks.

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
KINETICS OF THERMAL DECOMPOSITION OF AMMONIUM NITRATE, by Bernard J. Wood and Henry Wise. Rept. on Contract DA 04-495-ORD-18. 29 Jan 54, 21p. 13 refs. Progress rept. no. 20-215.
Order from LC mi$2.70, ph$4.80 PB 139 985

Experimental measurements of the kinetics of thermal decomposition of ammonium nitrate have been made in the temperature range from 423 to 553°K. The results indicate that the degradation of ammonium nitrate is an autocatalytic liquid-phase reaction, the rate of which is proportional to the product of the mass of salt and the mass of acid. The activation energy for this process is found to be 31.4 kcal. Adjustment of the amount of acid present offers an effective means for the control of the rate of thermal degradation of ammonium nitrate.

Massachusetts Inst. of Tech., Cambridge.
HYDROGEN PEROXIDE LABORATORIES: QUARTERLY PERIODIC STATUS REPORT, by W. C. Schumb and C. N. Satterfield. Rept. on Contract Nonr-1841(11). 30 June 58, 17p. 11 refs.
Order from LC mi$2.40, ph$3.30 PB 139 967

Contents:
Stability studies
Heterogeneous catalysis in liquid hydrogen peroxide
Burning velocities of the H_2O_2 decomposition flame at low pressures

Massachusetts Inst. of Tech., Cambridge.
IGNITION LIMITS OF HYDROGEN PEROXIDE VAPOR AT PRESSURES ABOVE ATMOSPHERIC, by C. N. Satterfield, F. Feakes, and N. Sekler. Rept. no. 53 on Contract Nonr-1841(11). 1 June 58, 13p. 3 refs. DSR no. 7476.
Order from LC mi$2.40, ph$3.30 PB 139 850

Mellon Inst. of Industrial Research, Pittsburgh, Pa.
SPECIAL LUBRICANTS, by George E. Barker. Final summary rept. for 30 Mar 42-30 June 45 on Navy Dept. Industrial Fellowship nos. 1 and 2, Mellon Inst. Fellowship no. 303, Contracts NOa(s)3914 and NXs-1978A. 7 Sep 45, 17p.
Order from LC mi$2.40, ph$3.30 PB 139 933

Special study has been made of one of the more promising lubricants designated as N-28. Hundreds of blends were tested and studied.

Office of Scientific Research and Development. Div. 3.
REVISIONS AND CORRECTIONS TO NDRC FORMAL REPORT NO. A-225, by W. H. Avery, R. E. Hunt, and L. D. Sachs (Allegany Ballistics Lab.). Weekly progress rept. Suppl. no. 6. 23 Dec 44, declassified 2 Sep 54. 27p. 2 refs. ABL-WPR, Suppl. 6; OSRD No. 4568; ATI-193 248.
Order from LC mi$2.70, ph$4.80 PB 140 089

Phillips Petroleum Co., Bartlesville, Okla.
EVALUATION OF FUEL CHARACTERISTICS IN THERMOJET ENGINE COMBUSTION PROCESSES, by E. H. Fromm. Progress rept. no. 5, 15 May-15 July 52, on Contract NOas-52-132-s. Aug 52, 42p. Rept. 403-16-52R.
Order from LC mi$3.30, ph$7.80 PB 135 707

In general, the data indicate five points of significance: (1) Deposition tendency of the fuels increased with increasing gum content. (2) Deposition and smoking tendencies of the fuels increased with increasing average volumetric boiling point. (3) Deposition and smoking tendencies of the fuels increased with decreasing hydrogen-carbon ratio. (4) Neither the "K" factor nor the lamp smoking tendency will adequately describe the deposition and smoking tendencies of the fuels tested, since neither takes into consideration the gum content of the fuel. (5) Fuels can be supplied under the present JP-4 specification which are far greater in deposition and smoking tendencies than those which have been indicated as being objectionable in full-scale operation with some turbojet engines.

Power Plant Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
SPECIFICATION MIL-F-25656(USAF), GRADE JP-6, FUEL, by C. R. Hudson. Mar 57, 12p. 4 refs. WADC Technical Note 57-121; AD-118 173.
Order from LC mi$2.40, ph$3.30 PB 140 003

The purpose of this report is to present information on a new grade of turbojet engine fuel, JP-6.

Propulsion Research Lab., Polytechnic Inst. of Brooklyn, N. Y.
SOME NUMERICAL METHODS OF SOLUTION OF NON-LINEAR PARTIAL DIFFERENTIAL EQUATIONS ARISING IN THE ANALYSIS OF SUBSONIC FLOW SYSTEMS WITH MASS AND HEAT ADDITION, by William Arthur Beardsley and Henry Berger. Rept. on Contract AF 49(638)165. 1 Dec 58, 78p. 4 refs. Technical note PRL-TN-58-2; AFOSR TN-59-79; AD-210 139.
Order from LC mi$4.50, ph$12.30 PB 140 036

This paper is concerned with four finite difference methods of solution for a system of three simultaneous partial differential equations which describe a one dimensional non-steady flow process with heat and mass addition which occurs in a rocket chamber. The partial differential equations are put into a finite difference form, and are used to calculate the variables (temperature, pressure, density, and velocity) throughout the x (position) - t (time) plane.

Leather and Textiles

Fabric Research Labs., Inc., Dedham, Mass.
SOME ANALYTICAL METHODS FOR BLEND DETERMINATION, by Myron J. Coplan. Technical rept. no. 5 on Contract Nonr-1422(00). 15 June 58, 35p. 17 refs.
Order from LC mi$3.00, ph$6.30 PB 140 181

For statistical evaluation of blend variation along the length of strands it is necessary to be able to determine the composition of a large number of small specimens. Microscopic techniques are useful, but tedious. The present report describes two other methods which have been developed: densitometric and micro-analytical spectrophotometric.

Naval [Supply Research and Development Facility] Bayonne, N. J.
REPLACEMENT OF INDIGO DYESTUFFS FOR USE ON NAVY WOOLEN FABRICS. PART III. PLANT APPLICATION PHASE, by Gordon Bradley. Rept. on Textile and Clothing Materials Development. June 58, 20p. 13 refs. Research and Development rept. no. 28.
Order from LC mi$2.40, ph$3.30 PB 137 367

An evaluation was conducted with 16 oz. wool melton fabrics dyed with experimental chrome dyestuff combinations on a plant application basis. Special emphasis was placed on evaluation of the visual and colorfastness properties of the experimental dyeings to determine how they compared with the same properties of the standard 16 oz. melton fabric. Spectrophotometric methods of analysis were conducted in order to substantiate the visual evaluation findings.

Paints and Finishes

Bureau of Yards and Docks, Washington, D. C.
PAINT FORMULAS. Engineered Performance Standards, Public Works Maintenance. Oct 58, 200p.
Order from LC mi$8.70, ph$30.30 PB 139 759

Bureau of Yards and Docks, Washington, D. C.
PAINT HANDBOOK. Engineered Performance Standards, Public Works Maintenance. July 57, 96p.
Order from LC mi$5.40, ph$15.30 PB 139 757

Bureau of Yards and Docks, Washington, D. C.
PAINT: PRIMARY SUPPORTING DATA. Engineered Performance Standards, Public Works Maintenance. July 57, 229p.
Order from LC mi$9.90, ph$34.80 PB 139 758

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
COATINGS FOR PROTECTING MOLYBDENUM FROM OXIDATION AT ELEVATED TEMPERATURE, by E. S. Bartlett, H. R. Ogden, and R. I. Jaffee. Rept. on Contract AF 18(600)1375. 6 Mar 59, 45p. 46 refs. DMIC rept. no. 109; AD-210 978.
Order from OTS $1.25 PB 151 064

Coatings that have been developed for protecting molybdenum from oxidation are described, and their protective capabilities discussed. The suitability of the various coatings is dependent upon the anticipated application. Protective coatings are considered from two points of view - the coating system and the method of application of the coating to the molybdenum base. Systems discussed include chromium, silicon, nickel, precious metals, ceramic materials, and refractory oxides. Methods of application are electroplating, flame spraying, vapor deposition, cladding, enameling, and liquid-phase diffusion. Capabilities of various semicommercial coatings are compared in a very general manner. The results of a number of service tests on coated molybdenum parts are summarized. These include investigations of materials for potential use as jet-engine turbine buckets, nozzle vanes, thermocouple protection tubes, ramjet flame-holder gutters, pitot tubes, glass-bath electrodes, and glass-bath stirring rods.

Horizons, Inc., Cleveland, Ohio.
RESEARCH FOR COATINGS FOR PROTECTION OF NIOBIUM AGAINST OXIDATION AT ELEVATED TEMPERATURES, by Emanuel C. Hirakis. Rept. on Metallic Materials, 1 July 57-31 Aug 58, Contract AF 33(616)5356. Feb 59, 74p. 16 refs. WADC Technical rept. 58-545; AD-209 914.
Order from OTS $2.00 PB 151 684

In order to profit from desirable high temperature properties of Nb, oxidation resistant alloys or coatings must be developed. Nb alloys have been prepared offering up to a 20 fold reduction in oxidation at 2000°F compared to pure Nb. Flame sprayed and

electrodeposited coatings were developed giving more complete protection for 4-6 hrs. up to 2500°F. Preparation of alloys and coatings together with test procedures and results are described for both phases.

Naval Ordnance Lab., White Oak, Md.
A COMPARISON OF THE NOL 24 FINISH WITH Y-1100 AND A-172 FINISHES AS THESE RELATE TO PLASTIC LAMINATE STRENGTH PROPERTIES, by P. W. Erickson and I. Silver. 16 Sep 57, 20p. 6 refs. NAVORD rept. 5742.
Order from LC mi$2.40, ph$3.30 PB 138 485

A comparative study, using glass fiber finishes and the NOL 24 finish demonstrated the consistent superiority of the NOL 24 finish on 181 style glass fabric laminates when fabricated with epoxy, polyester, phenolic and melamine laminates.

Naval Ordnance Test Station, China Lake, Calif.
EFFECT OF SOLAR RADIATION ON THE TEMPERATURES IN METAL PLATES WITH VARIOUS SURFACE FINISHES, by C. M. Arney and C. L. Evans, Jr. May 53, 15p. 2 refs. NOTS 2097; NAVORD rept. 6401.
Order from LC mi$2.40, ph$3.30 PB 140 279

Measurements were made of the temperatures attained by metal plates, coated with various surface finishes, when exposed to solar radiation. The surface finishes were those common in field use, as well as a glyptal-titanium dioxide paint specially developed at NOTS. It is found that white pigmented paints are superior to other surfaces, including aluminum and chromium plating. The NOTS-developed paint was superior to all the other surfaces tested.

Ohio State U. Research Foundation, Columbus.
SOME PHYSICAL PROPERTIES OF ENAMELS DEVELOPED FOR USE AT HIGH TEMPERATURES ON SEVERAL NONSTRATEGIC STEELS, by R. Maynard King and Louis J. Trostel, Jr. Rept. no. 67 on Ceramic Components for Aircraft Power Plants, Contract W33-038-ac-14217. Oct 51, 11p. WADC Technical rept. 52-25; ATI-150 005.
Order from LC mi$2.40, ph$3.30 PB 140 354

This report covers results of tests made to determine the protective value at high temperatures of six enamels applied to a group of nonstrategic steels being investigated as possible substitute materials for stainless steel or Inconel in jet-propelled engines or other devices.

Photographic Materials

Aeronautical Chart and Information Center, St. Louis, Mo.
THE PHANTOM TRANSPARENCY TECHNIQUE OF NEGATIVE REVISION, by Robert H. Sicking and Kenneth R. Deardorf. Rev. Mar 59, 16p. ACIC Technical rept. no. 81.
Order from OTS $0.50 PB 151 648

This report describes the "phantom transparency technique," a means of providing the rapid and accurately controlled revision of silver-emulsion film negatives by use of a reversible transparentizing process. A solution, called the "transparentizer," is applied to the area concerned, and when sufficient translucency is obtained, the negative is placed over source copy and the desired detail traced therefrom by cutting in the emulsion with scribing instruments. Opacity is restored by application of "restorer," and the area is the same as before except for the added scribed matter. Those parts of the previously-existing image no longer wanted are now deleted by application of opaquing fluid. Stick-up, such as names, and patterned areas like printed swamp and sand symbolization, can also be accurately placed by an auxiliary technique described in the report.

Ansco Div., General Aniline and Film Corp., Binghamton, N. Y.
REDUCTION OF THE EFFECTS OF NUCLEAR GAMMA RADIATION ON PHOTOGRAPHIC SILVER HALIDE EMULSIONS, by D. A. Nepela, H. F. Nitka and others. Final rept. for 1 Jan 56-30 June 58 on Contract DA 36-039-sc-70172. [1958] 93p. 11 refs. AD-202 787.
Order from LC mi$5.40, ph$15.30 PB 140 165

The sensitivity of all photographic materials to nuclear radiation leaves little doubt that their usefulness in areas of high radiation levels, resulting from a nuclear explosion or from deliberate contamination with waste fission products, is seriously impaired. The present investigation was undertaken to evolve a photographic material or procedures, whereby acceptable ground or low altitude aerial reconnaissance photographs could be taken despite the existence of a high ambient level of gamma radiation.

Plastics

Brown U. Div. of Engineering, Providence, R. I.
FRACTURES PRODUCED BY STRESS PULSES IN GLASS-LIKE SOLIDS, by H. Kolsky and Y. Y. Shi. Technical rept. no. 7 on Contract Nonr-562(14). Feb 58, 27p. 11 refs.
Order from LC mi$2.70, ph$4.80 PB 138 441

Measurements have been made of the amplitudes of the maximum tensile stress pulses which could propagate along rods of glass and of two glass-like plastics (polystyrene and polymethylmethacrylate) without producing fracture. Small quantities of explosive were detonated at one end of the rod so that a compression pulse travelled down the rod and on reflection at the opposite end returned as a tension pulse. In the two plastics, it was found possible to produce purely internal cracks which resulted from the slightly higher tensile stress in the interior of the rod.

General Mills, Inc., Minneapolis, Minn.
BALLOON BARRIER MATERIALS, by A. A. Anderson, Jr. and G. L. Morfitt. Final technical rept. for 15 Mar 57-14 Mar 58 on Contract AF 19(604)1393.

14 Apr 58, 134p. 18 refs. Rept. no. 1837; AFCRC-TR-58-211; AD-152 504.
Order from LC mi$6.90, ph$21.30 PB 140 105

The temperature and time dependence of the mechanical properties of polyethylene film have been examined by determining highly accurate, uniaxial stress-strain curves using a photographic technique and by developing an apparatus and performing preliminary experiments to determine stress-strain behavior under biaxial stress. The toughness-temperature characteristics have been examined over the range from room temperature to -77°C. The effect of environmental conditions and mechanical history on balloon materials has been examined.

Massachusetts U., Amherst.
THE CHANGE IN DENSITY OF LOW PRESSURE POLYETHYLENE ON STRETCHING, by Richard S. Stein and Frederick A. Bettelheim. Technical rept. no. 7 on Some Optical Studies of Polymer Structure, Contract Nonr-2151(00). 13 June 58, 6p. 5 refs.
Order from LC mi$1.80, ph$1.80 PB 139 846

Naval Civil Engineering Lab., Port Hueneme, Calif.
ENGINEERING EVALUATION OF REINFORCED PLASTIC PONTOONS, by J. J. Traffalis. Final rept. 5 Jan 59, 23p. 5 refs. Technical rept. R-021; AD-205 594.
Order from LC mi$2.70, ph$4.80 PB 140 278

A description of plastic pontoons, the test procedure used, and the results of the tests conducted are given in this report. The plastic pontoons are physically interchangeable with the P-1 and the T6B steel pontoons but do not have the structural capabilities of the steel pontoon.

Plastics Lab., Princeton U., N. J.
THE DYNAMIC MECHANICAL SPECTRA AND LIMIT OF LINEAR VISCOELASTIC RESPONSE OF SOME POLYOLEFINS, by R. J. Haughwout and B. Maxwell. Rept. 12B on Contract DA 36-039-sc-70154. 15 Sep 58, 39p. 9 refs. Technical rept. 51B.
Order from LC mi$3.00, ph$6.30 PB 138 512

It is the purpose of this report to investigate the feasibility of employing dynamic testing methods to compile data for design purposes and for the evaluation of polymers. The dynamic mechanical spectra and limit of linear response of linear polyethylene, isotactic polypropylene, and a blend of the two are discussed and compared, and the effect of blending of polymers on physical properties is studied.

Rock Island Arsenal Lab., Ill.
SPRAYABLE STRIPPABLE FILM CONTAINER OUTDOOR STORAGE TESTS, by R. L. Murrens. 16 July 58 [31]p. Rept. no. 58-1853; AD-203 429
Order from OTS $1.00 PB 151 299

Spray-formed vinyl and vinyl-mastic-vinyl units containing panels of various metals preserved by VCI or silica gel, in combination with P-3 and P-9 were exposed to outdoor weathering for periods of seven months and twelve months. Upon completion of these periods, the panels were removed and examined for corrosion. It was found that panels of aluminum, phosphate plated steel, and cadmium plated steel remained in excellent condition without additional preservation. Preservatives P-3 and P-9 provided protection to steel panels without additional preservation. Preservation by VCI or static dehumidification (silica gel) provided protection to bare steel, copper, silver and brass panels. VCI was compatible with P-3, P-9 and all metals used in the test. Magnesium panels showed corrosion in the form of light to heavy staining in units containing VCI or silica gel, and light corrosion in the form of a light oxide coating in units containing no VCI or silica gel. VCI chemical rendered clear plastic inspection windows opaque, and covered color change spots on humidity indicator cards. Methyl ethyl ketone solvent vapors, in the presence of the various panels, preservatives and moisture indicating instruments used in the tests, caused no apparent harmful effects. Sprayed film averaging .040 inches with .025 inches as a minimum appeared to be effective. No additional protection was realized in films averaging .060 inches. The weathering effects on the films produced by the compounds supplied by three different proprietary sources were similar. The quality of the films produced was dependent on the spraying technique used. Additional storage tests are recommended to obtain further data on the storage life and protective ability of one-coat spray-formed vinyl containers.

Samuel Feltman Ammunition Labs., Picatinny Arsenal, Dover, N. J.
EFFECT OF PROLONGED STRESS ON GLASS-REINFORCED POLYESTER LAMINATES, by Joan M. Kuchkuda. Nov 57 [6]p. Tech. Notes 14; AD-147 155.
Order from OTS $0.25 PB 151 298

Glass-polyester laminates were immersed in a stressed condition in Varsol to determine whether the laminates are susceptible to stress-cracking. The laminates were subjected to a stress equal to about 94% of their ultimate flexural strength. At the end of 8 wk, the specimens were removed from the Varsol. No cracks were visible to the naked eye, or after treatment by spot-check dye penetrant, or when viewed under 20X magnification. It was assumed that the laminates would not stress-crack when used in a stressed condition in an ordinary air atmosphere.

Rubber and Elastomers

Coating and Chemical Lab., Aberdeen Proving Ground, Md.
FIELD TEST OF NATURAL RUBBER BRAKE CUPS AND COMMERCIAL SYNTHETIC (GRS) RUBBER BRAKE CUPS, by Virgil O. Hatch. 4 Mar 57, 9p. 3 refs. Rept. no. CCL #19.
Order from LC mi$1.80, ph$1.80 PB 137 545

Kellogg, M. W., Co., Jersey City, N. J.
ARCTIC RUBBER, by A. N. Bolstad, E. S. Lo, and C. J. Benning. Research rept. for Aug 53-Aug 56 on Contract DA 44-109-qm-1580. 15 Aug 56, 42p. Rept. RL-56-498; AD-115 398.
Order from LC mi$3.30, ph$7.80 PB 139 976

The purpose of the Arctic Rubber Project was the preparation of an oil- and fuel-resistant rubber which retains its elastic properties over the range -70°F. to 160°F; the development of a rubber suitable for use at 500°F and the investigation and solution of accompanying problems of monomer preparation, polymerization techniques and polymer evaluation.

Rock Island Arsenal Lab., Ill.
SYNTHESIS OF DIENE ELASTOMERS BY MEANS OF STEREOSPECIFIC CATALYSTS: A LITERATURE SURVEY, by Wolfgang H. Jurgeleit. 24 Feb 58, 52p. 147 refs. Rept. no. 58-389.
Order from OTS $1.50 PB 151 433

A short introduction of the theory of isomerism in vinyl and diene homopolymers is given. A survey of the available scientific and patent literature on stereospecific polymerization catalysts is presented with an emphasis on their use in synthesizing elastomers from diolefins.

MATHEMATICS

Applied Mathematics and Statistics Lab., Stanford U., Calif.
EXTREMUM PROBLEMS FOR THE COEFFICIENT a_3 OF THE BOUNDED UNIVALENT FUNCTIONS, by Vikramaditya Singh. Technical rept. no. 69 on Contract Nonr-225(11). 22 Aug 57, 31p. 8 refs.
Order from LC mi$3.00, ph$6.30 PB 135 897

Applied Mathematics and Statistics Lab., Stanford U., Calif.
MODEL FOR THE EXPERIMENTAL MEASUREMENT OF THE UTILITY OF GAMBLING, by Halsey L. Royden, Patrick Suppes, and Karol Walsh. Technical rept. no. 14 on Contract Nonr-225(17). 25 Sep 57, 18p. 5 refs.
Order from LC mi$2.40, ph$3.30 PB 135 895

Applied Mathematics and Statistics Lab., Stanford U., Calif.
NONLINEAR MODEL FOR THE EXPERIMENTAL MEASUREMENT OF UTILITY, by Patrick Suppes and Karol Walsh. Technical rept. no. 11 on Contract Nonr-225(17). 21 Aug 57, 23p. 4 refs.
Order from LC mi$2.70, ph$4.80 PB 135 892

[Applied Mathematics and Statistics Lab., Stanford U., Calif.]
ON CERTAIN DIFFERENTIAL-INTEGRAL EQUATIONS, BY S. Karlin and G. Szegő. Rept. on [Contract DA 04-200-ORD-675]. [1958] 51p. 7 refs.
Order from LC mi$3.60, ph$9.30 PB 139 857

Applied Mathematics and Statistics Lab., Stanford U., Calif.
SOME EXTREMAL PROBLEMS FOR A NEW CLASS OF UNIVALENT FUNCTIONS, by Vikramaditya Singh. Technical rept. no. 68 on Contract Nonr-225(11). 22 Aug 57, 19p. 5 refs.
Order from LC mi$2.40, ph$3.30 PB 135 896

California U., Berkeley.
LOWER BOUNDS FOR THE FIRST EIGENVALUE OF ELLIPTIC EQUATIONS AND RELATED TOPICS, by M. H. Protter. Technical rept. no. 8 on Contract AF 18(600)1117. Jun 58, 27p. 6 refs. AFOSR TN-58-434; AD-158 238
Order from LC mi$2.70, ph$4.80 PB 135 156

California U., Berkeley.
ON TENSOR PRODUCTS OF n-PLANE BUNDLES, by Emery Thomas. Technical rept. no. 8 on Contract AF 49(638)79. Nov 58, 54p. 8 refs. AFOSR TN-58-1022; AD-206 362.
Order from LC mi$3.60, ph$9.30 PB 140 154

This paper is concerned with the following problem: given two real vector bundles ξ^p and η^q over the same base space X, give a simple definition of the tensor bundle $\xi^p \otimes \eta^q$ over X and express the characteristic classes $W(\xi^p \otimes \eta^q)$ in terms of the classes $W(\xi^p)$ and $W(\eta^q)$.

California U., Los Angeles.
ON THE CONVERSE OF SAVAGE'S CRITERION FOR THE WEAKNESS OF AN IDEAL BOUNDARY COMPONENT, by Kotaro Oikawa (Tokyo Inst. of Tech.). Technical rept. no. 9 on Contract DA 04-495-ORD-722. Sep 58, 11p. 8 refs.
Order from LC mi$2.40, ph$3.30 PB 136 590

Carnegie Inst. of Tech., Pittsburgh, Pa.
ON A CLASS ON NON-LINEAR SECOND-ORDER DIFFERENTIAL EQUATIONS, by Zeev Nehari. Technical rept. no. 25 on Contract AF 49(638)227. Apr 59, 34p. 5 refs. AFOSR TN-59-179; AD-211 319.
Order from LC mi$3.00, ph$6.30 PB 140 046

This paper deals with the oscillatory properties of solutions of the differential equation
(a) $y'' + y\,F(y^2, x) = 0$, $y = y(x)$,
where $F(t, x) > 0$ for $x > 0$, $t > 0$, and $t^{-\epsilon} F(t, x)$ is an increasing function of t for some postive ϵ and constant x. A number of conditions are derived which are either necessary or sufficient for the existence of a non-oscillatory solution of (a).

Cornell U., Ithaca, N. Y.
CONVERGENCE OF ORTHOGONAL SERIES, by Ralph Palmer Agnew. Rept. no. 81 on Contract AF 18(600)685. Mar 59, 10p. 2 refs. AFOSR TN-

59-206; AD-211 660.
Order from LC mi$1.80, ph$1.80 PB 140 025

It is very well known from the L_2 theory of Fourier series that if (i) the functions $\phi_0, \phi_1, \phi_2, \ldots$ form an orthonormal set over a set E and if (ii) the series $a_0\phi_0(x) + a_1\phi_1(x) + \ldots$ converges in L_2 to a function f in L_2 over E, then (iii) the contants a_k must be the Fourier coefficients of f. It is also well known from the Riemann theory of trigonometric series that if the ϕ's constitute the ordinary trigonometric (or complex exponential) set, then (i) and (ii') pointwise convergence of $\Sigma a_k \phi_k(x)$ to a function f in L_2 over E, imply (iii). It is now shown that (i) and (ii') do not imply (iii). Related results are given.

Cornell U., Ithaca, N. Y.
INVERSION OF TOEPLITZ MATRICES, by A. Calderon, F. Spitzer, and H. Widom. Rept. no. 76 on Contract AF 18(600)685. Mar 58, 15p. 3 refs. AFOSR TN-58-489; AD-158 297.
Order from LC mi$2.40, ph$3.30 PB 140 047

Conditions are found for the invertibility of the Toeplitz matrix $T = (c_{j-k})$ $j, k = 0, 1, \ldots$. In case $\Sigma_{-\infty}^{\infty} |c_k| < \infty$, T is a bounded operator on the space of bounded sequences and a necessary and sufficient condition for the invertibility of T is found, and the matrix T^{-1} is produced. As a consequence of the theory a Tanberian theorm is proved. In case $\Sigma_{-\infty}^{\infty} c_k e^{ik\theta}$ is in $L_\infty(-\pi, \pi)$, T is a bounded operator on the space of square summable sequences and a sufficient condition is found for the invertibility of T.

Cornell U., Ithaca, N. Y.
MINIMAX FUNCTIONS, CONFIGURATION FUNCTIONS, AND PARTITIONS, by Ralph Palmer Agnew. Rept. no. 77 on Contract AF 18(600)685. May 58, 28p. 4 refs. AFOSR TN-58-490; AD-158 298.
Order from LC mi$2.70, ph$4.80 PB 140 068

This is a study of two classes of functions and relations among them. The first is the class of configuration functions defined by R. W. Murphy [IBM Journal of Research and Development, vol. 1, (1957), pp. 158-170]. These functions occur in data processing by electronic computers. The record is a class of minimax functions. Part of the work involves a partition problem which was originated by Dedekind and is related to the determination of the number of free distributive lattices having n generators.

Cornell U., Ithaca, N. Y.
ON RAPIDLY MIXING TRANSFORMATIONS AND AN APPLICATION TO CONTINUED FRACTIONS, by M. Kac and Harry Kesten. Rept. no. 78 on Contract AF 18(600)685. June 58, 7p. 1 ref. AFOSR TN-58-491; AD-158 299.
Order from LC mi$1.80, ph$1.80 PB 140 072

A central limit theorem for occupation times is proved and applied to the digits of continued fractions.

Cornell U., Ithaca, N. Y.
OPTIMUM DESIGNS IN REGRESSION PROBLEMS, by J. Kiefer and J. Wolfowitz. Rept. no. 79 on Contract AF 18(600)685. Feb 59, 36p. 15 refs. AFOSR TN-58-389; AD-154 298.
Order from LC mi$3.00, ph$6.30 PB 140 048

Suppose Y_{x_i}, $i = 1, \cdots, n$, are independent random variables with $EY_x = \Sigma_1^k a_j f_j(x)$ for $x \in \mathcal{X}$, where the f_j are known and the a_j are the unknown regression coefficients; $\mathrm{Var}(Y_x) = v(x)\sigma^2$, where v is known. We consider the optimum allocation of the x_i for problems of statistical inference (1) about a_k, (2) about the s parameters $a_{k-s+1}, \cdots, a_k$, (3) about the whole function $\Sigma a_j f_j$. Algorithms are obtained which facilitate the computation of optimum designs (for several different optimality criteria, in the case of (2)). Examples are given which show the great simplification to be achieved by the use of these algorithms, over a more direct approach.

Flight Research Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
CARDINAL SPECTRUM ANALYSIS OF PHYSICAL SYSTEMS, by Frank W. Bubb. Mar 51, 29p. 7 refs. AF Technical rept. 6300; ATI-136 925.
Order from LC mi$2.70, ph$4.80 PB 140 167

A method of analyzing and synthesizing linear physical systems such as servomechanisms and electrical filters is presented here in terms of simple algebraic operations on cardinal spectra, namely, on sets of equally spaced ordinates of the time functions concerned. This method takes its mathematical origin in the theory of interpolating functions and this approach is outlined in an appendix. However, the main ideas of the method are intuitively evident in terms of simple physical examples, and will be so presented. Its relation to the traditional methods, such as the differential equation method, frequency response method, and Laplace transfer function method are mentioned.

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
ORDERING PRINCIPLE AND GENERALIZED SOLUTIONS OF CERTAIN QUASI-LINEAR PARTIAL DIFFERENTIAL EQUATIONS, by Avron Douglis. Rept. on Contract AF 18(600)573. May 58, 42p. Technical note no. BN-136; AFOSR TN-58-456; AD-158 263
Order from LC mi$3.30, ph$7.80 PB 135 160

In this paper is set forth a simple unifying principle governing the solutions of continuous and discontinuous initial value problems for partial differential equations of the form (1.1) $u_t + (F(u))_x = 0$ with convex, or concave, F(u). This principle provides easy, elementary means both to construct these solutions and also to demonstrate their uniqueness and other properties.

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
SOLUTION AND HUYGENS' PRINCIPLE FOR A SINGULAR CAUCHY PROBLEM, by David W. Fox.

Rept. on Contract AF 49(638)228. July 58, 39p. 12 refs. Technical note BN-137; AFOSR-TN-58-568; AD-158 387.
Order from LC mi$3.00, ph$6.30 PB 135 570

This paper gives an explicit solution in the large of the singular Cauchy problem for the hyperbolic equation.

Institute of Mathematical Sciences, New York U., N. Y.
ASYMPTOTIC SOLUTION OF EIGENVALUE PROBLEMS, by S. I. Rubinow and Joseph B. Keller. Rept. on Contract AF 19(604)4555. Feb 59, 81p. 11 refs. Research rept. no. CX-38; AFCRC-TN-59-227; AD-210 926.
Order from LC mi$4.80, ph$13.80 PB 140 145

A method is presented for the construction of asymptotic formulas for the large eigenvalues and the corresponding eigenfunctions of boundary value problems for partial differential equations. It is an adaptation to bounded domains of the method previously devised to deduce the corrected Bohr-Sommerfeld quantum conditions.

Institute of Statistics, North Carolina U., Chapel Hill.
NOTE ON A CLASS OF PROBLEMS IN "NORMAL" MULTIVARIATE ANALYSIS OF VARIANCE, by S. N. Roy and J. Roy. Rept. on Contract AF 18(600)83. Nov 57, 9p. 2 refs. Mimeograph Series no. 184; AFOSR TN-57-749; AD-136 737.
Order from LC mi$1.80, ph$1.80 PB 132 980

Institute of Statistics, U. of North Carolina, Chapel Hill.
THIRD ORDER ROTATABLE DESIGN IN FOUR DIMENSIONS, by Norman R. Draper. Rept. on Contract AF 18(600)83. May 58, 6p. 2 refs. Mimeograph series no. 198; AFOSR TN-58-484; AD-158 292.
Order from LC mi$1.80, ph$1.80 PB 135 407

Institute of Tech., U. of Minnesota, Minneapolis.
ON A FUNDAMENTAL THEOREM OF THE CALCULUS OF VARIATIONS, by James Serrin. Rept. on Contract AF 18(603)31. 15 Aug 58, 29p. 22 refs. AFOSR-TN-58-458; AD-158 265.
Order from LC mi$2.70, ph$4.80 PB 136 488

Maryland U., College Park.
TOPOLOGICAL STRUCTURES FOR A SPACE OF CONTINUOUS FUNCTIONS, by Richard Eugene McGill. Rept. on Contract AF 18(603)78. June 58, 28p. 9 refs. AFOSR TN-58-548; AD-158 365.
Order from LC mi$2.70, ph$4.80 PB 135 574

This paper discusses the properties and relationships of seven topologies on the linear space of real valued continuous functions defined on the closed unit interval. The theory of quasi-convergence classes is developed in order to have a unified method for defining many of the topologies.

Miami U. [Coral Gables, Fla.]
STOCHASTIC PROCESSES WITH DISCRETE STATE SPACE, by D. G. Austin. Rept. on Contract AF 49(638)184. Aug 58, 76p. 19 refs. AFOSR TN-58-967; AD-205 779.
Order from LC mi$4.50, ph$12.30 PB 137 777

Stochastic processes with state space the integers, time-parameter the non-negative real line, and with conditional probabilities that depend only on increments of time are investigated. Sample function properties and analytic properties of the conditional probabilities are developed without the Markov hypothesis. In this way the exact effect of the Markov hypothesis on these properties will be in evidence.

Minnesota U., Minneapolis.
ON ISOMETRIC EQUIVALENCE AND SIMILARITY OF CERTAIN VOLTERRA OPERATORS, by Gerhard K. Kalisch. Rept. on Contract AF 49(638)64. 12 June 58, 19p. 4 refs. AFOSR TN-58-535; AD-158 351.
Order from LC mi$2.40, ph$3.30 PB 135 412

This paper is a continuation and extension of another paper by the author, the theorems and proofs of which remain valid with appropriate changes due to the presence of the new constant a, except for the proof of Theorem 2. Theorem 1 of the present paper contains the desired generalization.

North Carolina U., Chapel Hill.
LIMITS FOR THE CHARACTERISTIC ROOTS OF A MATRIX. VII, by Alfred T. Brauer. Technical rept. no. 10 on Contract AF 18(603)38. July 58, 14p. 9 refs. AFOSR TN-58-659; AD-162 190.
Order from LC mi$2.40, ph$3.30 PB 137 687

In the recently published book of E. Bodewig, Matrix Calculus, some results of the earlier parts of this paper are mentioned. It is stated there that they are of theoretical interest, but have no practical value. In this paper it will be shown that they can easily be used for practical computations.

Purdue U., Lafayette, Ind.
CONVOLUTION OPERATORS WHICH ARE NOT OF SCALAR TYPE, by G. L. Krabbe. Technical note no. 5 on Some Spectral Mappings on the Space L^p, Contract AF 18(603)44. 30 Apr 58, 9p. 8 refs. AFOSR TN-58-396; AD-154 305.
Order from LC mi$1.80, ph$1.80 PB 140 155

This note is to be followed by an article which attempts to extend the scope of the Spectral Theorem beyond Dunford's class of scalar type operators. Additional motivation for such an extension is presented here.

Purdue U., Lafayette, Ind.
ON THE MIXTURE OF DISTRIBUTIONS, by Harry Teicher. Technical rept. no. 1 on Contract Nonr-1100(11). Feb 58, 40p. 17 refs. PRF no. 1745.
Order from LC mi$3.00, ph$6.30 PB 139 873

If $\mathcal{F}=\{F\}$ is a family of distribution functions and μ is a measure on a Borel Field of subsets of $\mathcal{F}$ with $\mu(\mathcal{F}) = 1$, then $\int F(\cdot)\, d\mu(F)$ is again a distribution function which is called a μ-mixture of $\mathcal{F}$. In section 3, convergence questions when either F_n or μ_k (or both) tend to limits are dealt with in the case where $\mathcal{F}$ is indexed by a finite number of parameters. Under a certain condition on $\mathcal{F}$, fulfilled in most cases of interest, the class of μ-mixtures is closed under convolution (Theorem 3). In section 4, a sufficient as well as necessary conditions are given for a μ-mixture of normal distributions to be normal. In the case of a product-measure mixture, a necessary and sufficient condition is obtained (Theorem 6). Generation of mixtures is discussed in section 5 and the concluding remarks of section 6 show a link between the problem of mixtures of Poisson distributions and a moment problem.

Purdue U., Lafayette, Ind.
VAGUELY NORMAL OPERATORS ON A BANACH SPACE, by G. L. Krabbe. Technical note no. 4 on Some Spectral Mappings on the Space LP, Contract AF 18(603)44. 5 Mar 58, 16p. 15 refs. AFOSR TN-58-163; AD-152 090.
Order from LC mi$2.40, ph$3.30 PB 140 156

This is the first of two articles concerned with extending to Banach space operators certain properties of normal (Hilbert space) operators.

RIAS, Baltimore, Md.
ON THE BEHAVIOR OF THE SOLUTIONS OF LINEAR PERIODIC DIFFERENTIAL SYSTEMS NEAR RESONANCE POINTS, by Jack K. Hale. Rept. on Contract AF 49(638)382. [1958] 59p. 13 refs. Technical rept. 58-13; AFOSR TN-59-12; AD-208 593.
Order from LC mi$3.60, ph$9.30 PB 140 042

It is an elementary problem to determine the solutions of a linear system of differential equations with constant coefficients, but if the coefficients in this equation are perturbed slightly by some periodic functions, the problem becomes very difficult. In 1940, L. Cesari developed a method of successive approximations for determining the solutions of linear periodic differential systems of the above type under the assumption that the basic frequencies of the imperturbed system were not in resonance with the frequency of the periodic disturbance. This method has been successively developed by L. Cesari, J. K. Hale and R. A. Gambill and applied to questions of the existence of periodic solutions of weakly nonlinear (close to linear) differential systems. The purpose of the present paper is to apply the same method to the discussion of the solutions of linear periodic systems in the important case when the frequencies of the imperturbed equation are in resonance with the frequency of the periodic disturbance. This is very important for determining the stability of a periodic solution of a system of nonlinear differential equations.

RIAS, Baltimore, Md.
THE STRUCTURE OF SEMI-SIMPLE LIE ALGEBRAS, by Melvin Hausner and Shlomo Sternberg. Rept. on Contract AF 49(638)382. 1958, 65p. Technical rept. 58-9; AFOSR TN-58-862; AD-203 673.
Order from LC mi$3.90, ph$10.80 PB 140 141

The contents of these notes were given as a seminar at RIAS by Shlomo Sternberg during the summer of 1958. The organization and writing of the manuscript was done by Melvin Hausner. The intent of the seminar was to give the Cartan-Killing structure results for semi-simple Lie algebras in a self-contained manner.

Rutgers U., New Brunswick, N. J.
DIVERGENCE THEOREM FOR DISCONTINUOUS VECTOR FIELDS, by Victor L. Shapiro. Rept. on Contract AF 18(600)1595. 11 Sep 57, 30p. 14 refs. AFOSR TN-57-569; AD-136 554.
Order from LC mi$2.70, ph$4.80 PB 135 089

The main theorem of this paper is the following: A necessary and sufficient condition that Z be a negligible set for the divergence theorem is that Z be of logarithmic capacity zero.

Stanford Electronics Labs., Stanford U., Calif.
ON THE SPECTRAL REPRESENTATION OF GAUSSIAN STOCHASTIC PROCESSES, by J. F. Bates. Technical rept. no. 39 on Contract Nonr-225(24). 5 June 58, 31p. 16 refs.
Order from LC mi$3.00, ph$6.30 PB 139 849

A method is advanced for expanding a class of gaussian stochastic processes in terms of a complete set of orthonormal functions such that the coefficients of the terms of the series expansion will be statistically independent. The class of processes considered are those whose correlation functions are the solutions of systems of linear, homogeneous differential equations with constant coefficients.

Washington U., Seattle.
DIFFERENTIAL GEOMETRY, by Albert Nijenhuis. Annual rept. for 15 June 57-15 June 58 on Contract Nonr-477(15). [1958] 10p.
Order from LC mi$1.80, ph$1.80 PB 139 886

Wayne State U., Detroit, Mich.
AFFINE TRANSFORMATIONS IN A QUATERNION MANIFOLD, by S. I. Goldberg. Rept. on Contract AF 49(638)14. Nov 58, 13p. 9 refs. AFOSR TN-58-1046; AD-206 755.
Order from LC mi$2.40, ph$3.30 PB 140 034

Wayne State U., Detroit, Mich.
A NOTE ON A THEOREM OF MATSUSHIMA AND YANO, by S. I. Goldberg. Rept. on Contract AF 49(638)14. Oct 58, 7p. 6 refs. AFOSR TN-58-954, AD-205 347.
Order from LC mi$1.80, ph$1.80 PB 140 037

Wayne U., Detroit, Mich.
ON CHARACTERIZATION OF THE EUCLIDEAN

SPHERE, by S. I. Goldberg. Rept. on Contract AF 49(638)14. Apr 58, 14p. AFOSR TN-58-451; AD-158 257.
Order from LC mi$2.40, ph$3.30 PB 135 159

Computing Devices

Ballistic Research Labs., Aberdeen Proving Ground, Md.
THAUMATURGY: A SIMPLIFIED METHOD OF CODING FOR ORDVAC, by M. J. Romanelli. Dec 57, 83p. 3 refs. Memo. rept. no. 1116.
Order from LC mi$4.80, ph$13.80 PB 139 928

The purpose of this report is to describe a simplified method of coding which will enable one to use the services of a high-speed computing machine, Ordvac. Emphasis has been placed on simplicity so that no previous experience in coding for high-speed computing machines is required. Illustrative examples are included.

Computation Lab., Harvard U., Cambridge, Mass.
DESIGN AND OPERATION OF DIGITAL CALCULATING MACHINERY. Progress rept. no. 34 for 10 May-10 Aug 54 on Contract AF 33(038)9461. [1954] 150p. 1 ref. AD-44 085.
Order from LC mi$7.20, ph$22.80 PB 140 098

Computation Lab., Harvard U., Cambridge, Mass.
THEORY OF SWITCHING: LINEAR PROGRAMMING WITH PATTERN CONSTRAINTS, by Willard Lawrence Eastman. Doctoral thesis. Rept. to Bell Telephone Labs. July 58, 165p. 20 refs. Rept. no. BL-20.
Order from LC mi$7.80, ph$25.80 PB 140 104

This thesis presents new methods for the solution of linear programming problems containing pattern constraints. Applications to specific problems of economic analysis are considered in the concluding chapter. Other chapters include: the Hitchcock-Koopmans transportation problem and the Ford-Fulkerson algorithm, the method of link exclusion and the traveling-salesman problem, transportation problems with non-linear costs.

Ferranti Electric, Inc., New York.
DEVELOPMENT OF AN ACOUSTIC DELAY LINE FOR DIGITAL STORAGE. Final rept. on Contract AF 19(604)2041. [1957] 67p. 6 refs. AFCRC-TR-57-367; AD-133 786.
Order from LC mi$3.90, ph$10.80 PB 135 384

This report describes investigations into an ultrasonic delay line using magnetostriction drivers, with the following results: (a) Experimentation with materials and heat treating has shown the possibility of achieving temperature coefficients of delay of approximately ±1 part per million per degree centigrade. (b) Design criteria are discussed for 1. Transducer 2. Reduction of dispersion 3. Line length 4. Mode converting junction (c) Quantitative figures are given for attenuation and dispersion. (d) Practical construction techniques have been worked out for a finished line. (e) The torsional mode has been shown practical for delays of 5 ms., at a storage capacity of 2500 bits. (f) Lines capable of operating at 1 megacycle bit rate and 500 microsecond delay have been achieved. (g) Techniques of measurement are described. (h) A recirculating store has been designed and fabricated to demonstrate the operation of a delay line at a digit rate of 500 kc./sec.

Iowa State Coll., Ames.
AUTOMATIC DATA PROCESSING MACHINE OPERATING WITH ESTERLINE ANGUS PAPER TAPE INPUT, by Robert M. Stewart, Jr. and Glen A. Richardson. Scientific rept. no. 1 on Contract AF 19(604)1042. 15 Apr 58, 103p. 18 refs. AFCRC TN-58-418; AD-152 586.
Order from LC mi$5.70, ph$16.80 PB 135 499

An automatic data processing machine is described which was developed to handle micro-meteorological records appropriate to the study of turbulence. These records include instantaneous elevation angle, azimuth angle and velocity at a point.

Princeton U., N. J.
PROGRAMMING A COMBINATORIAL PUZZLE, by Dana S. Scott. Technical rept. no. 1 on Contract Nonr-1858(22). 10 June 58, 21p.
Order from LC mi$2.70, ph$4.80 PB 139 963

In studying the difficulties of communicating well-posed problems to digital computers, it seems desirable to gain experience not only with engineering problems, which are principally arithmetical, but also with problems that are principally logical. For this purpose a variant of the geometrical placement puzzle called "pentominos" was programmed for the von Neumann computer. This report is an account of the logical difficulties encountered and how they were solved. It incidentally includes solutions to the puzzle.

Washington U., Seattle
A PROGRAM TO SCORE RATING SCALES ON THE IBM TYPE 650, by Calvin E. Wright and Paul Horst. Rept. on Contract Nonr-477(08). June 58, 7p. 4 refs.
Order from LC mi$1.80, ph$1.80 PB 140 179

This program will score rating scales of up to 483 items, producing up to 21 trait scores where each trait is represented by a subset of not more than 23 items. All item scores must be positive numbers of one, two, or three digits, and all trait scores will be punched as three digit numbers with the location of the decimal point determined from information provided on a parameter card. The input card form is that of the basic statistics program. The output card form is identical with the input card form so that the trait scores obtained can be immediately further analyzed by employing the basic statistics or correlation matrix programs.

Western Reserve U., Cleveland, Ohio.
ACOUSTIC DELAY LINE MEMORY FOR HUTCHINSON-SCARROTT KICKSORTER, by B. L. Robinson. Rept. on Contract AF 18(603)61. 8 Dec 58, 6p. 4 refs. AFOSR TN-58-1033; AD-206 483.
Order from LC mi$1.80, ph$1.80 PB 140 035

The multiple channel pulse height analyzer (kicksorter) of Hutchinson and Scarrott stores the numerical results of the pulse height analysis in a serial type computer memory, commonly called the acoustic delay line memory. A train of acoustic pulses is circulated in a transmitting medium with a period depending on the dimensions and characteristic velocity of sound in the medium. The contents of the memory may be changed only when they pass through a circuit located between the receiver and transmitter. Typically the pulses may be one microsecond apart (one megacycle "clock rate") and the delay may be a millisecond. In this case there would be provision for the storage of a thousand binary digits, if the absence or presence of a pulse in any microsecond interval is interpreted as a binary "0" or "1", respectively.

MECHANICS

Brown U. Div. of Applied Mathematics, Providence, R. I.
AN EXPERIMENT ON COMPRESSIBLE FLOW PERTURBATIONS, by T. A. d'Ews Thompson and R. E. Meyer. Rept. on Contract AF 49(638)232. June 58, 28p. 4 refs. AFOSR TN-58-447; AD-158 253.
Order from LC mi$2.70, ph$4.80 PB 135 620

The effect which a slight tilting of liners of a supersonic wind-tunnel nozzel has on the Mach number distribution in the test-rhombus is determined on the basis of the linear perturbation theory (The Aeronaut. Quart. 7:71-84, Feb. 1956). Experiments are reported which (1) confirm that the first-order subsonic and transonic perturbations of the flow may be neglected compared with the supersonic perturbations, and (2) indicate that appreciable effects not accounted for by the first-order theory occur when the flow possesses high local pressure gradients.

Columbia U., New York.
THERMODYNAMICS AND VARIATIONAL PRINCIPLES FOR INELASTIC MEDIA, by A. M. Freudenthal. Technical rept. no. 5 on Contract Nonr-266(34). June 58, 22p. 21 refs. CU 5-58 ONR 266(34)CE.
Order from LC mi$2.70, ph$4.80 PB 140 001

Variational principles for inelastic media are derived on the basis of thermodynamic considerations. The well-known variational principles of linear viscous and plastic media are shown to be special cases of the general principles for dissipative media.

European Office, Air Research and Development Command.
PROCEEDINGS OF THE MEETING ON TURBULENCE, 11-14th MAY 1957 IN THE MATHEMATICAL RESEARCH INSTITUTE AT OBERWOLFACH, ed. by Hans Gebelein. Rept. on Contract AF 61(514)925. June 57, 24p. AFOSR TN-57-529; AD-136 514.
Order from LC mi$2.70, ph$4.80 PB 135 584

In the course of this conference, the main traits of the research work under contract have been discussed, and by comparison of the results with those from other theoretical approaches a valuable survey on the actual situation of turbulence research was obtained. Thus the proceedings of this symposium also provide an account of the research in question performed during 1956 under the support of ARDC through its European Office.

Guggenheim Aeronautical Lab., Calif. Inst. of Tech., Pasadena.
MAGNETOHYDRODYNAMIC WAVES, by J. D. Cole. Rept. on Contract AF 49(638)476. Jan 59, 30p. 6 refs. AFOSR-TN-59-13; AD-208 594.
Order from LC mi$2.70, ph$4.80 PB 140 153

The aim of this paper is to study some special magnetohydrodynamic waves and their connection with the methods of their production, that is, the boundary conditions. Possible wave motions of a fluid form the underlying structure of the mathematical description; hence a knowledge of their behavior leads to a deeper understanding of fluid dynamical problems. Furthermore there is some evidence that these waves can be produced in the laboratory and may occur in nature.

Naval Supersonic Lab., Mass. Inst. of Tech., Cambridge.
ON SOME FUNDAMENTALS IN MAGNETO-FLUID-MECHANICS, by Eugene E. Covert. Doctoral thesis. Mar 58, 206p. 94 refs. Technical rept. no. 247.
Order from LC mi$9.60, ph$31.80 PB 140 368

The basic equations of magneto-fluid-mechanics are derived from classical kinetic theory for a gas consisting of neutral particles, positive particles (ions) and electrons. Included are the equations of conservation of mass and momentum for each type of particle, an energy equation, the Maxwell equations of electrodynamics, and suitable state equations. The basic equations are normalized and the resulting dimensionless parameters are discussed briefly. Formulae for the fluid properties are presented, and a summary of the values of these properties is given. Some elementary solutions are given to illustrate the nature of magneto-fluid interactions. The problem of adding energy to a gas by magneto-fluid mechanical means is discussed and it is concluded that these means are practical only at high power densities (i.e., 700 kw/ft^2 $\sim$ 5 x 10^6 BTU/sec-ft^2). A device which absorbs such power densities and generates a plasma is discussed theoretically and some preliminary experimental results from this device are given.

Plasmadyne Corp., Santa Ana, Calif.
SOME DYNAMICS PROBLEMS OF THE PUNCH METHOD OF HEATING AND ACCELERATION OF PLASMAS, by Henricus G. Loos. Technical note no. 2 of a series of three technical notes on Contract AF

49(638)335. Feb 59, 33p. 4 refs. T-2TN029-35; AFOSR TN-59-256; AD-212 256.
Order from LC mi$3.00, ph$6.30 PB 140 055

A few dynamics problems encountered in punch discharges have been discussed. The fully ionized plasma is supposed to interact with the magnetic field only at the plasma boundary; the analysis is limited to time intervals in which the effect of ion-ion collisions may be neglected. The type of discharge for the basic cylindrical punch geometry depends solely on two nondimensional parameters. A scaling law is derived for changes for which these two parameters remain the same. For compressions or expansions that take place in a time short compared with the ion-ion collision time, but which hava a current sheet velocity that is small compared with the mean ion speed, the discharge coil with the moving plasma inside assumes a constant inductance.

Polytechnic Inst. of Brooklyn, New York.
DISCONTINUITY SURFACES IN MAGNETO FLUIDYNAMICS, by Luigi G. Napolitano. Rept. on Contract AF 49(638)217. Dec 58, 40p. 6 refs. PIBAL rept. no. 503; AFOSR TN-59-67; AD-209 842.
Order from LC mi$3.00, ph$6.30 PB 140 039

This report is concerned with the macroscopic study of magneto-fluid-dynamic discontinuities for negligible relativistics effects. Jump conditions relating the end states on the two sides of discontinuity surfaces of arbitrary geometry are derived for both the steady and unsteady cases. Applications are presented in connection with: (a) the magneto-fluid-dynamic counterpart of the Truesdell-Lighthill-Hayes problem of determining the vorticity jump across a shock, and (b) the existence of magneto-fluid-dynamic slip and/or contact surfaces.

Polytechnic Inst. of Brooklyn, N. Y.
A NOTE ON SHEAR CENTERS OF THIN-WALLED CLOSED SECTIONS IN THE PRESENCE OF CREEP, by K. A. V. Pandalai and Sharad A. Patel. Rept. on Contract AF 49(638)302. Feb 59, 28p. 2 refs. PIBAL rept. no. 487; AFOSR TN-59-190; AD-211 311.
Order from LC mi$2.70, ph$4.80 PB 140 060

This note is concerned with shift of shear centers of beams of thin-walled closed sections subjected to creep. The method of solution is based on simplifying the creep problem to one of nonlinear elasticity by means of the elastic analog. The results show that in the presence of creep the shear center can shift significantly from its position corresponding to the linear, elastic theory.

Aerodynamics and Pneumatics

Aeronautical Research Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
ON THE REPRESENTATION OF DYNAMIC PRESSURE IN ANALOG SIMULATIONS INVOLVING LARGE CHANGES IN ATMOSPHERIC DENSITY, by Alfred C. Robinson and Frank Niuman. Rept. on Flight Dynamics Research and Analysis Facility. Aug 58, 17p. 1 ref. WADC Technical note 58-209; AD-207 163.
Order from OTS $0.50 PB 151 709

In analog simulations involving flights through and beyond the earth's atmosphere the range in density encountered can be as much as a million to one. This places a severe limitation on the applicability of analog simulation to trajectory problems where dynamic pressure (porportional to the product of density and the square of velocity) is important. The technique presented here circumvents this difficulty by computing the dynamic pressure from a differential equation rather than the algebraic expression. The method is applied to two problems and it is shown that the dynamic pressure can be computed to well within analog accuracy for density changes of up to 10^5 to one.

Arnold Engineering Development Center, Tullahoma, Tenn.
A METHOD OF CALCULATING TURBULENT-BOUNDARY-LAYER GROWTH AT HYPERSONIC MACH NUMBERS, by James C. Sivells and Robert G. Payne. Rept. on Contract AF 40(600)700. Mar 59, 46p. 34 refs. AEDC TR-59-3; AD-208 774.
Order from LC mi$3.30, ph$7.80 PB 139 916

A method is developed for calculating the growth of a turbulent boundary layer at hypersonic Mach numbers. Excellent agreement with experimental results from axisymmetric nozzles has been obtained by the application of this method. The method utilizes a modification of Stewartson's transformation to simplify the integration of the momentum equation. Heat transfer is taken into account by evaluating the gas properties at Eckert's reference temperature and by using a modification of Crocco's quadratic for the temperature distribution in the boundary layer. A new empirical relation is used for the incompressible friction coefficient which agrees with experimental data over a Reynolds number range from 10^5 to 10^9.

Brown U. Div. of Applied Mathematics, Providence, R. I.
CALCULATION OF SUPERSONIC FLOW PAST A FLAT-HEAD CYLINDER BY BELOTSERKOVSKII'S METHOD, by Ruby Gold and Maurice Holt. Rept. on Contract AF 49(638)232. Mar 59, 26p. 5 refs. AFOSR TN-59-199; AD-211 525.
Order from LC mi$2.70, ph$4.80 PB 139 947

Belotserkovskii's method of calculating the supersonic flow past a circular cylinder is applied to the case of a flat headed cylinder. The surface pressure distribution and associated flow field (including the shape of the detached shock wave) are determined for a prescribed incident Mach number. Only the first approximation of Belotserkovskii is considered. Selected physical variables are assumed to vary linearly between the body and the shock, thereby reducing the original problem to one of solving three ordinary differential equations. The boundary conditions are obtained from symmetry conditions on the axis of symmetry, the oblique shock equations and the condition that sonic speed is attained at the sharp shoulder.

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
THEORY OF CAMBERED JOUKOWSKY AIRFOILS IN SHEAR FLOW, by A. Sowyrda. Rept. on Contract DA 44-177-tc-439. Sep 58, 34p. 4 refs. Rept. no. AI-1190-A-2; AD-201 868.
Order from LC mi$3.00, ph$6.30 PB 136 835

A development of two-dimensional airfoil theory is presented which extends the existing theory of symmetrical Joukowsky airfoils in uniform shear flow to cambered airfoils. Some numerical results are given to show the relative effects of flow shear, and airfoil camber and thickness, on lift and pitching moment (there being no drag). Expressions are given from which the velocity distribution on the airfoil can be evaluated for the family of profiles and flow conditions considered.

David Taylor Model Basin, Washington, D. C.
PRELIMINARY WIND-TUNNEL INVESTIGATION OF A METHOD OF SUPPRESSING THE LEADING-EDGE STALL ON A WING BY TANGENTIAL BLOWING, by H. R. Chaplin. Mar 56, declassified 1 July 57. 26p. Aero rept. 894.
Order from LC mi$2.70, ph$4.80 PB 135 329

The results of a preliminary wind-tunnel investigation using an end-plated model of an F9F-5 wing section incorporating high-speed air ejection over the leading edge are presented. The leading-edge blowing is found to be very effective in preventing separation over the forward section of the wing. The results also indicate that the leading-edge blowing has a stabilizing effect on the flow over the flap, and suggest that the flow over the entire upper surface of a wing might be controlled with the use of very little more air than would be required for controlling the flow over full-span flaps alone.

Deutsche Forschungsanstalt für Luftfahrt (Germany).
MEASUREMENTS ON TWO-DIMENSIONAL CASCADES AT HIGH SUBSONIC MACH NUMBERS. PART II. MEASUREMENTS OF LOSS COEFFICIENTS, by U. Hopkes. Rept. on Contract AF 61(514)934. 28 Jan 58, 29p. 4 refs. Institut für Aerodynamik rept. no. 57/23a; AFOSR TN-57-289a. AD-203 031.
Order from LC mi$2.70, ph$4.80 PB 140 111

Measurements of loss coefficients of cascades at high subsonic Mach numbers are presented. These measurements have been done for constant Reynolds number, but varying the Mach number. -These measurements were mainly done to test the new experimental set-up for wake-survey measurements in the variable density high speed cascade wind tunnel of the Deutsche Forschungsanstalt für Luftfahrt, Braunschweig.

Guggenheim Aeronautical Lab., Calif. Inst. of Tech., Pasadena.
EXPANSION PROCEDURES AND SIMILIARITY LAWS FOR TRANSONIC FLOW, by Arthur F. Messiter, Jr. Rept. on Contract AF 18(600)383. Sep 57, 109p. 10 refs. OSR Technical note 57-626; AD-136 613.
Order from LC mi$5.70, ph$16.80 PB 139 955

Guggenheim Aeronautical Lab., Calif. Inst. of Tech., Pasadena.
SMALL ASPECT RATIO MEMBRANE FLUTTER, by Ronald Stearman. Rept. no. 1 on Contract AF 49(638)220. Jan 59, 52p. 19 refs. GALCIT-95; AFOSR [TN]-59-45; AD-209 415.
Order from LC mi$3.60, ph$9.30 PB 140 040

An experimental investigation has been made on the flutter of small aspect ratio rectangular membranes in a subsonic flow. The leading and trailing edges of the membrane were restrained from vertical movement while the other two edges were free. Both surfaces of the membrane were exposed to the airstream, and the membrane tension was applied through the trailing edge. The results of the test show that two types of flutter occur. The first to appear as the wind speed was increased from zero, with a fixed tension level in the membrane, was a small amplitude flutter which had a shallow wave like motion traveling in the streamwise direction. At higher wind speeds this motion was damped out. A narrow equilibrium zone or boundary existed which separated the first type of flutter from a second type of motion having a traveling wave of larger amplitude and greater speed. This second type of flutter had no tendency to damp out, but became more violent as the wind speed was increased.

Harvard U. Div. of Engineering and Applied Physics, Cambridge, Mass.
THE BOUNDARY LAYER ON A FLAT PLATE WHEN THE MAIN STREAM HAS UNIFORM SHEAR, by James D. Murray. Rept. on Contract Nonr-1866(34). June 58, 15p. 5 refs.
Order from LC mi$2.40, ph$3.30 PB 139 827

The region behind a bow shock wave is associated with an inviscid rotational flow. This vorticity in the inviscid flow will in some way affect the boundary layer on the body. To provide some understanding of the effects on a viscous boundary layer of a free stream vorticity, the laminar boundary layer in a two-dimensional incompressible fluid of constant properties on a semi-infinite flat plate is studied, when the main stream has uniform shear.

Heat Transfer Lab., U. of Minnesota, Minneapolis.
AN EXPERIMENTAL STUDY OF THE EFFECTS OF NON-UNIFORM WALL TEMPERATURE ON HEAT TRANSFER IN LAMINAR AND TURBULENT AXI-SYMMETRIC FLOW ALONG A CYLINDER, by R. Eichhorn, E. R. G. Eckert and A. D. Anderson. Rept. on Contract AF 33(616)5528. July 58, 68p. 17 refs. WADC Technical rept. 58-33; AD-207 906.
Order from OTS $1.75 PB 151 680

Measurements of both the hydrodynamic and thermal characteristics of flow over an axial cylinder at subsonic speeds are reported. It was found that the boundary layer along an axial cylinder tends to become asymmetrical, as it approaches the transition point. The asymmetry vanishes again in turbulent flow. For both laminar and turbulent flow, the average boundary layer growth could be predicted by the standard flat plate relationships, and simple methods were deduced for determining the effective hydrodynamic length of the boundary layers. Local and

total heat transfer measurements were made with both laminar and turbulent flow for various unheated starting lengths followed by linearly increasing wall temperatures. For laminar flow agreement with theory was obtained, this agreement being improved by the Seban and Bond cylindrical curvature correction. The turbulent flow results indicated preference for the theory of Seban.

Heat Transfer Lab., Mass. Inst. of Tech., Cambridge.
TRANSIENT HEAT TRANSFER IN LAMINAR FLOW IN THE ENTRANCE REGION OF TUBES WITH HEAT CAPACITY, by Vedat S. Arpaci. Rept. on Contract AF 33(616)3157. Jan 59, 94p. 28 refs. WADC Technical rept. 59-14; AD-210 479.
Order from OTS $2.25 PB 151 717

The transient heat transfer phenomenon in laminar incompressible flow at the entrance region of tubes having small length-to-diameter ratios has been investigated. To introduce the effect of heat capacity of the tube-wall, the principle of conservation of energy for the tube-wall was considered in addition to the usual fluid continuity, momentum, and energy equations. Assuming that the velocity profiles at the entrance region of the tube can be approximated by velocities of the laminar incompressible flow over a flat plate, the solution of the fluid flow problem was taken from previous work. The remaining two partial differential equations, the fluid and tube-wall energy equations, have been solved by using the method of successive approximations. A modified Nusselt number based on the step temperature input is defined. The theory has been checked by some experimental measurements. The first approximation of the tube-wall temperature has been compared with a quasi-steady theory.

Illinois U. Engineering Experiment Station, Urbana.
COMPRESSIBLE NON-ISOENERGETIC TWO-DIMENSIONAL TURBULENT (Pr_t=1) JET MIXING AT CONSTANT PRESSURE; AUXILIARY INTEGRALS, HEAT TRANSFER AND FRICTION COEFFICIENTS FOR FULLY DEVELOPED MIXING PROFILES, by H. H. Korst and W. L. Chow. Rept. on Transonic and Supersonic Flow of a Real Fluid and Abrupt Increases in Cross Section, Contract AF 18(600)392. Jan 59, 21p. 6 refs. ME Technical note 392-4; AFOSR TN-59-380; AD-213 685.
Order from LC mi$2.70, ph$4.80 PB 139 952

Definitions and graphical presentation of auxiliary functions, calculated on a high speed digital computer (ILLIAC), pertaining to the two-dimensional non-isoenergetic turbulent jet mixing problem. Theoretical friction coefficients and Stanton Numbers for such mixing regions are given. The results facilitate especially the treatment of jet-slipstream interaction (base pressure and base temperature problem).

Institute of Engineering Research, U. of California, Berkeley.
STATIC STABILITY ANALYSIS FOR A WEDGE IN FREE MOLECULE FLOW, by Hartley H. King. Master's thesis. Rept. on Subcontract to Contract AF 04(645)24. 31 Dec 58, 47p. 7 refs. HE-150-165; Series no. 125, Issue no. 1.
Order from LC mi$3.30, ph$7.80 PB 139 854

The aerodynamic center or neutral stability point location along the wedge axis at zero angle of attack is computed for wedges with semi-vertex angles of five and thirty degrees. The calculations show that the neutral stability point is always aft of the 50% chord, which would be the result for a flat plate (zero wedge angle).

Institute of Engineering Research, U. of California, Berkeley.
AN OXYACETYLENE FLAME APPARATUS FOR SURFACE ABLATION STUDIES, by D. Wizansky and E. J. Russ. Technical rept. no. 1 on Contract DA 04-200-ORD-776. 28 Jan 59, 28p. 4 refs. HE-150-167; Series no. 128, issue no. 1.
Order from LC mi$2.70, ph$4.80 PB 139 855

The design of an apparatus for producing surface ablation along a specimen parallel to an oxyacetylene flame is described. A standard torch is employed, supplying hot combustion gases to a test section of approximately 1.4 by 4 inches. At optimum conditions a flame temperature of about 5800 F is predicted and a gas velocity of 200 ft/sec. Calculations of the heat transfer to the flat plate specimen under these conditions are presented. These indicate a maximum initial heat rate near the leading edge of 10^5 Btu/hr ft^2.

Massachusetts Inst. of Tech., Cambridge.
EXTRACTION OF AIRCRAFT STABILITY COEFFICIENTS FROM FLIGHT TEST DATA AND THEORETICAL AND EXPERIMENTAL STUDIES ON SELECTED PROBLEMS OF HIGH SPEED AERODYNAMICS AND DYNAMIC STABILITY, by Lloyd E. Wilkie. Final rept. on Flight Control Technical Requirements, Contract AF 33(616)3064. Dec 57, 150p. 33 refs. WADC Technical rept. 57-723; AD-210 119.
Order from OTS $2.75 PB 151 719

The primary objective of this program was to study the various factors which influence the determination of linear and nonlinear stability information from the flight records of high-speed aircraft and missiles involved in large amplitude maneuvers. The principal effort centered on the analytical study of the extraction problem. Supplemental investigations in theoretical and experimental aerodynamics and in the wind-tunnel measurement of rotary stability coefficients were concurrently performed with the purpose of theoretically predicting and measuring nonlinear force and moment variations. Simulated flight responses which were obtained on the Whirlwind I digital computer were used to study the effects on extraction accuracy of data precision, data length, data increment, and factors pertinent to a given extraction method.

Odin Associates, Pasadena, Calif.
AERO-THERMODYNAMIC PROPULSION METHOD, by S. Lal and I. Michelson. Rept. on Contract AF 18(600)1501. Sep 56, 86p. 94 refs. Rept. no. 100-1; AFOSR TN-56-523; AD-110 341.
Order from LC mi$4.80, ph$13.80 PB 135 264

A first-phase study is summarized in which the basic aerodynamic and propulsion properties are investigated for a propulsive system in which friction heating of the boundary layer is utilized for the vaporization and superheating of an internally circulated coolant-fuel. For supersonic flow within the earth's atmosphere, there is a double benefit from such an arrangement: reduction to within tolerable limits of peak skin temperatures, as well as improvement of propellant performance as compared with fuels at ordinary temperatures. The aerodynamic investigation consists of an examination of heat transfer properties of boundary layers on three-dimensional configurations at moderate and high Mach numbers, in relation to the skin friction of the same layers. Computations are carried out for the specific impulse of sample coolant-fuels.

Odin Associates, State College, Pa.
STUDIES IN MAGNETO-AERODYNAMICS. I. ONE-DIMENSIONAL FLOWS. II. STABILITY OF LAMINAR BOUNDARY LAYER, by H. Li, L. Michelson, and J. Rabinowicz. Rept. on Contract AF 49(638)13. Dec 57, 43p. 9 refs. TR-102-1; AFOSR TR-58-28; AD-152 206.
Order from LC mi$3.30, ph$7.80 PB 135 414

The governing equations of magneto-aerodynamics are examined for the weak interaction approximation. It is found that for the case where $R_V R_H << 1$ it is possible to treat the magneto-aerodynamic interaction as a simple additional body force. Accordingly, the approximate equations for weak interaction are derived. These are applied to several simple one-dimensional flows such as the propagation of small disturbances and one-dimensional channel flow.

Oklahoma U. Research Inst., Norman.
GENERAL EXPERIMENTAL TECHNIQUES IN ELECTRIC SHOCK TUBE STUDIES, by William B. Edwards and Richard G. Fowler. Summary rept. on Contract Nonr-982(02). Sep 57, 46p. AD-141 178.
Order from LC mi$3.30, ph$7.80 PB 135 738

The three major lines of approach which were undertaken were: relation of power input velocity; investigation of spectrographic data which had been resolved in time and space; and investigation of Mach lines produced by an airfoil placed in the expansion chamber. Great consideration was given in each instance to make all equipment as flexible in application as possible.

Ordnance Aerophysics Lab., Convair, Daingerfield, Tex.
DESCRIPTION OF A MULTICHANNEL SYSTEM FOR DIGITAL INDICATING AND RECORDING OF RESISTANCE STRAIN GAGE DATA, by H. B. Godwin, C. G. Martin and others. Rept. on Contract NOrd-9028. 31 Mar 50, 53p. OAL rept. 224; CM 583.
Order from LC mi$3.60, ph$9.30 PB 137 780

A multichannel system for digital indicating and recording of resistance wire strain gage data has been designed and built. In the present application, wind tunnel data are punched in cards and listed in one automatic operation, with a resolution of one part in 4000. The system, however, can be used with any similar resistance-bridge circuit.

Pisa U. (Italy).
THE AERODYNAMICS OF AIRFOILS IN NON-UNIFORM STREAMS OF INCOMPRESSIBLE FLUID, by Enrico Pistolesi and Marino Marini. Technical note no. 1 on The Aerodynamics of Bodies in Non-Uniform Flow, Contract AF 61(514)1051. [1950] 22p. 2 refs. AFOSR TN-59-111; AD-210 391.
Order from LC mi$2.70, ph$4.80 PB 140 150

Subject of the present research is the study of the aerodynamic behavior of an airfoil immersed in a bidymensional stream of incompressible perfect fluid adjacent to another bidimensional stream of incompressible perfect fluid having a different velocity. The interface between the two streams is constituted, from infinity upstream to a point situated at a finite distance from the airfoil, by a rigid wall.

Pisa U. (Italy).
THE AERODYNAMICS OF AIRFOILS IN NON-UNIFORM SUPERSONIC STREAMS, by Enrico Pistolesi and Marino Marini. Technical note no. 3 on The Aerodynamics of Bodies in Non-Uniform Flow, Contract AF 61(514)1051. 47p. AFOSR TN-59-113; AD-210 393.
Order from LC mi$3.30, ph$7.80 PB 140 147

The aim of the present research is the study of the aerodynamic characteristics of an airfoil situated in a bidimensional supersonic stream (1) adjacent to another didimensional supersonic stream (2) having different velocity. The research has been accomplished adopting the small perturbation theory; the airfoil has been supposed to be a flat plate disposed at a small angle of attack in the stream (1). All the compression and expansion waves have been supposed weak and such as to be represented by means of Mach waves.

Pisa U. (Italy).
THE AERODYNAMICS OF AIRFOILS IN NON-UNIFORM STREAMS: SUBSONIC AND SUPERSONIC STREAMS, by Enrico Pistolesi and Marino Marini. Technical note no. 2 on The Aerodynamics of Bodies in Non-Uniform Flow, Contract AF 61(514)1051. 23p. AFOSR TN-59-112; AD-210 392.
Order from LC mi$2.70, ph$4.80 PB 140 149

Subject of this research is the study of the aerodynamic characteristics of an airfoil situated in a subsonic stream adjacent to a supersonic stream constituted of a stream of finite width bounded at the lower side by a rigid wall or constituted of a jet of finite width.

Polytechnic Inst. of Brooklyn, N. Y.
EXPERIMENTAL PRESSURE DISTRIBUTIONS ON CONICAL ELLIPTICAL BODIES AT $M_\infty = 3.09$ AND 6.0, by Victor Zakkay and Marian Visich, Jr. Rept. on Contract AF 49(638)217. Mar 59, 39p. 11 refs. PIBAL rept. no. 467; AFOSR TN-59-10; AD-208 591.
Order from LC mi$3.00, ph$6.30 PB 139 997

Pressure distributions over two elliptical cones having a 16.7° equivalent circular cone, and a ratio of the

major to the minor axis of a/b equal to 1.39 and 1.78 are presented for different angles of attack. A hypersonic approach similar to Newtonian is suggested for the determination of the pressure distribution. The resulting pressure distribution as determined by this method compares more favorably with the experimental results than the Newtonian theory.

Princeton U., N. J.
AN EXPERIMENTAL INVESTIGATION OF THE FLOW OVER SIMPLE TWO-DIMENSIONAL AND AXIAL SYMMETRIC BODIES AT HYPERSONIC SPEED, by I. E. Vas, S. M. Bogdonoff, and A. G. Hammitt. Rept. on Research on Boundary Layer Characteristics in the Presence of Pressure Gradients at Hypersonic Speeds, Contract AF 33(616)2547 June 57, 41p. 24 refs. Aeronautical Engineering rept. no. 382; WADC TN-57-246; AD-130 826.
Order from LC mi$3.30, ph$7.80 PB 140 367

A study of the inviscid shock shape and pressure distribution about thick two-dimensional and axial symmetric bodies was conducted in the Princeton University Helium Hypersonic Tunnel. Details were obtained for flat and semicircular leading edges for Mach numbers between 11 and 19. From the Schlieren pictures, the shock shape, detachment distance and sonic point on the shock were found. Similar pressure distributions were obtained for corresponding two-dimensional and axial symmetric bodies.

Princeton U., N. J.
PRELIMINARY INVESTIGATIONS OF SPIKED BODIES AT HYPERSONIC SPEEDS, by S. M. Bogdonoff and I. E. Vas. Rept. on Research on Boundary Layer Characteristics in the Presence of Pressure Gradients at Hypersonic Speeds, Contract AF 33(616)5416. Mar 58, 39p. 21 refs. Rept. no. 412; WADC TN-58-7; AD-142 280.
Order from LC mi$3.00, ph$6.30 PB 140 002

Generally accepted solutions for the problems of hypersonic flight appear, at the moment, to be centered around the use of blunt bodies to minimize the heat transfer rates. There are, however, several other solutions to the problem; and as part of an exploratory study of these solutions, a detailed examination has been made of the flow over blunt bodies equipped with a spike. These tests, carried out at a Mach number of about 14 in the Princeton Helium Hypersonic Tunnel, have investigated the effect of varying spike lengths for flat-faced and hemispherically-nosed axially symmetric bodies. Detailed pressure distributions have been obtained as well as heat transfer rates.

Propulsion Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
INVESTIGATIONS TOWARD THE DEVELOPMENT OF AN AERODYNAMIC STRIP ANALYSIS FOR SINGLE ROTATION PROPELLERS OPERATING AT LOW AIRSPEEDS AND/OR LOW ADVANCE RATIOS, by James P. Cooper. Rept. on Propeller Aerodynamic Analysis. Jan 58, 21p. 5 refs. WADC Technical note 58-98; AD-151 146.
Order from LC mi$2.70, ph$4.80 PB 140 097

The current interest in VTOL and STOL aircraft has placed renewed emphasis on the development of accurate methods for the prediction of propeller blade loading and performance at low airspeeds and/or low advance ratios. This report describes investigations made toward development of a single rotation aerodynamic strip analysis for use with propellers or "rotor-propellers" operating under these conditions. A double iterative flow field treatment was developed, from Theodorsen's basic work, which accounts for both wake displacement velocity and wake slipstream contraction and the analysis programmed for solution on a high speed digital computer. For simplification, flight is considered under conditions of axial flow normal to the actuator disc.

Propulsion Research Corp., Santa Monica, Calif.
THE STREAMSURFACE CHARACTERISTICS METHOD FOR SUPERSONIC FLOW, WITH APPLICATION TO SUPERSONIC COMPRESSORS, by Henry G. Loos. Rept. on Theoretical and Experimental Supersonic Flow Studies Related to Turbomachine Design, Contract AF 18 (600)1143. May 56, 93p. 5 refs. Rept. no. R-207; AFOSR TN-56-367; AD-95 803.
Order from LC mi$5.40, ph$15.30 PB 134 697

The characteristics method has been developed for the analysis of supersonic flows along a curved surface of general but given shape and with a given distance to an infinitesimally adjacent stream-surface. The resulting compatibility equations have a simple form and from them the equations for all possible applications of the two-dimensional characteristics method to the analysis of isentropic supersonic flows can be derived.

Rensselaer Polytechnic Inst., Troy, N. Y.
ON THE INDETERMINATENESS OF THE BOUNDARY CONDITIONS FOR A MIXING PROBLEM, by K. T. Yen. Rept. on Contract AF 49(638)23. Dec 57, 16p. 5 refs. TR-AE5710; AFOSR TN-58-449; AD-158 255.
Order from LC mi$2.40, ph$3.30 PB 135 158

Results obtained from a study of the indeterminateness of the boundary conditions for laminar mixing of two "free" parallel streams under constant pressure is presented in this report. A method is given for the determination of the interface velocity in the mixing region as well as the transverse force acting on the dividing wall as a consequence of the mixing. Numerical examples are given to show that values of interface velocity obtained here differ appreciably from those obtained by using other proposed boundary conditions.

Rensselaer Polytechnic Inst., Troy, N. Y.
STUDY OF THE USE OF OPTIMAL COORDINATES FOR SOME VISCOUS PROBLEMS, by K. T. Yen. Rept. on Contract AF 49(638)23. Apr 58, 34p. 8 refs. TR AE 5805; AFOSR TN-59-11; AD-208 592.
Order from LC mi$3.00, ph$6.30 PB 139 911

A study of the use of optimal coordinates for (a) boundary layer flows of the wedge type and (b) a simple shear flow over a flat plate is made. It is shown that, for these problems, optimal coordinates can be found to achieve smooth transition from the inner viscous

flow to the "outer" free stream flow. The significance of these coordinates and some features of the physical problems are discussed. In particular, the boundary layer problem of a flat plate is considered in some detail: a new definition of boundary layer thickness is proposed and some points concerning the properties of the Blasius solution and the boundary layer solution in parabolic coordinates are discussed. For the simple shear flow it is shown that parabolic coordinates can be used as the optimal coordinates. Two methods of solution for this problem with vorticity index $\omega_0 \sim 1$ and $\omega_0 \ll 1$, respectively, are given.

Stanford U., Calif.
SOME PRELIMINARY RESULTS OF VISUAL STUDIES ON THE FLOW MODEL OF THE WALL LAYERS OF THE TURBULENT BOUNDARY LAYER, by Stephen J. Kline and Peter W. Runstadler. Rept. MD-3 on Contract AF 49(638)295. Apr 58, 17p. 16 refs. AFOSR-TN-58-160; AD-152 187.
Order from LC mi$2.40, ph$3.30 PB 135 335

Preliminary studies of the flow model in the wall layers of the turbulent boundary layer are presented. Results are summarized for investigations of positive pressure gradients, zero and negative pressure gradients, readjusting zones, and the later stages of transition. In all cases, the special visual methods developed for these studies show a definite three dimensional vortex flow model. The presently available details of this model are described, a possible interpretation of the physics of the turbulent boundary layer is given, and some of the many implications of the flow model are discussed.

Hydrodynamics, Hydraulics, and Hydrostatics

David Taylor Model Basin, Washington, D. C.
THE CALCULATION OF PROPELLER INDUCTION FACTORS: AML PROBLEM 69-54, by J. W. Wrench, Jr. Feb 57, 19p. 7 refs. Rept. 1116, reprint of Applied Mathematics Lab. Technical rept. 13.
Order from LC mi$2.40, ph$3.30 PB 140 028

The abridged Nicholson asymptotic formulas for the modified Bessel functions of the first and second kinds are herein replaced by more accurate asymptotic formulas. These are derived and then applied to the evaluation of illustrative numerical examples of slowly convergent Kapteyn series involved in the calculation of propeller induction factors. The resulting values of the induction factors are then compared with those obtained by means of the Nicholson formulas.

David Taylor Model Basin, Washington, D. C.
THE MOMENT ACTING ON A RANKINE OVOID MOVING UNDER A FREE SURFACE, by Hartley L. Pond. Sep 51, declassified 26 June 58, 22p. 19 refs. Rept. C-429.
Order from LC mi$2.40, ph$3.30 PB 140 027

The moment acting on a Rankine Ovoid moving under the free surface of a fluid of infinite depth is calculated. The solution is carried through two approximations. The results of the second approximation are shown to be in excellent agreement with available experimental data.

David Taylor Model Basin, Washington, D. C.
THE TAYLOR MODEL BASIN DIAPHRAGM BLAST GAGE, by B. Sussholz. Dec 43, declassified 19 Oct 51 36p. 9 refs. Rept. 508.
Order from LC mi$3.00, ph$6.30 PB 140 009

The theory of operation of the TMB diaphragm blast gage is presented with a series of design curves. The advantages of a spiral-type strain element are indicated. A detailed discussion is then given of the gage design, auxiliary equipment, calibration technique and gage characteristics such as sensitivity, natural frequency and damping factor. Methods of eliminating undesirable acceleration effects are included. A number of necessary precautions are noted, and several sample blast pressure records taken in field tests are given.

Heat Transfer Lab., U. of Minnesota, Minneapolis.
REARRANGEMENT OF THE TEMPERATURE-FIELD IN FLOW AROUND A BEND, by E. R. G. Eckert and T. F. Irvine, Jr. Technical note no. 15 on Contract Nonr-710(14). Aug 57, 41p. 5 refs.
Order from LC mi$3.30, ph$7.80 PB 135 735

The present paper reports on a study of the effects of secondary flows and is intended as a first contribution in this area by directing attention to this problem and by presenting quantitative information on a specific duct shape. The velocity and temperature fields have been investigated in detail by measurement and by flow visualization in a bend of a specific shape.

Institute of Mathematical Sciences, New York U., N. Y.
A FORMAL SOLUTION OF THE EQUATIONS OF STATISTICAL EQUILIBRIUM, by Bruno Zumino. Rept. on Contract AF 49(638)341. Oct 58, 9p. 10 refs. Research rept. no. HT-1; AFOSR-TN-59-74; AD-209 849.
Order from LC mi$1.80, ph$1.80 PB 140 038

A closed expression is given for the distribution on functions in the classical theory of statistical equilibrium. This expression, when suitably expanded, permits one to obtain rather simply the general term in the virial expansion of the distribution functions and of the equation of state.

Institute of Tech., U. of Minnesota, Minneapolis.
THE DERIVATION OF STRESS-DEFORMATION RELATIONS FOR A STOKESIAN FLUID, by James Serrin. Rept. on Contract AF 49(638)262. 20 Jan 59, 17p. 11 refs. AFOSR TN-58-1095; AD-207 582.
Order from LC mi$2.40, ph$3.30 PB 140 134

Institute of Tech., U. of Minnesota, Minneapolis.
POISEUILLE AND COUETTE FLOW OF NON-NEWTONIAN FLUIDS, by James Serrin. Rept. on Contract AF 49(638)262. 20 Jan 59, 13p. 6 refs.

AFOSR TN-58-1087; AD-207 584.
Order from LC mi$2.40, ph$3.30 PB 140 043

National Research Labs., Ottawa (Canada).
THE COMOX TORPEDO: A CANADIAN CONTRIBUTION TOWARDS HYDROFOIL DEVELOPMENT, by M. S. Kuhring. June 58, 44p. 5 refs. Rept. ME-210.
Order from LC mi $3.30, ph$7.80 PB 135 823

This report describes the development problems encountered in producing, during the period July 1943 to March 1944, an expendable 20-foot hydrofoil craft suitable for smoke laying. The craft was capable of operating at speeds up to 40 m.p.h. in seas of 6 to 9 feet in height. Some suggestions for further study are given.

Polytechnic Inst. of Brooklyn, N. Y.
TURBULENT FLOW IN CHANNELS WITH POROUS WALLS, by S. W. Yuan. Rept. on Contract Nonr-839(16). Aug 57, 14p. 2 refs. PIBAL rept. no. 407.
Order from LC mi$2.40, ph$3.30 PB 139 018

The problem of two-dimensional turbulent flow in channels with two equally porous walls has been investigated. The axial velocity distribution is expressed as functions of velocity through porous walls, the axial pressure gradient and the empirical constant K.

Quartermaster Research and Engineering Center, Natick, Mass.
ON THE THEORY OF MIXING OF FLUID STREAMS, by Harold J. Hoge. Feb 59, 63p. 8 refs. Technical rept. PR-2.
Order from LC mi$3.90, ph$10.80 PB 139 943

A new approach to the problem of mixing of fluid streams is presented, based on the concepts of "characteristic velocity" and "characteristic momentum-flux". These defined quantities reduce the problem of mixing to one that is formally analogous to a rigid-body problem. A mixing equation is presented that is a function only of the characteristic momentum fluxes, which in turn are functions only of the stream velocities. No local temperatures or pressures are involved, but these and other properties of the streams are readily obtained from the known velocities. The treatment is "one-dimensional". The usefulness of the new approach is demonstrated by applying it to several hitherto unsolved problems in the theory of jet compressors (ejectors). Efficiencies, compression ratios, and expansion ratios are presented as functions either of input velocity-numbers, or of entrainment ratio and channel-area ratio, for various selected operating conditions. The existence of forbidden regions in the velocity-number plane is pointed out.

Aeroelastic and Structures Research Lab., Mass. Inst. of Tech., Cambridge.
INELASTIC DIFFUSION IN PANELS, by M. M. Chen. Rept. on Contract no. AF 49(638)160. Nov 58, 14p. 5 refs. Research rept. ASRL-TR-76-1; AFOSR-TN-59-33; AD-209 205.
Order from LC mi$2.40, ph$3.30 PB 140 041

The problem of inelastic diffusion in stiffened panels has been studied. The governing ordinary differential equation has been solved numerically for the case where the Ramberg-Osgood exponent, n, is equal to 20. For the case of $n = 2$ the solution is in a closed form. Numerical results have been carried out for several loading levels and for several geometrical parameters.

Air Force Missile Development Center, Holloman AFB, N. Mex.
THE RELATION BETWEEN THE BENDING STRAIN AND THE LOAD FOR A BEAM ON AN ELASTIC FOUNDATION, by Alfred W. Simon. Mar 59, 15p. 8 refs. AFMDC-TR-59-7; AD-210 010.
Order from LC mi$2.40, ph$3.30 PB 140 140

Formulas giving the bending strain for a single concentrated load and for two concentrated loads placed a fixed distance apart on the missile test track are deduced, and the relation between this strain and the parameters of the missile track is given. A calculation of the strain produced by a single concentrated load of 20,000 pounds shows that it is of the order of 10 millionths inch/inch; hence, it would be difficult to measure. A calculation of the corresponding bending stress gives a figure of the order of 300 lbs/in.^{2}, a more reasonable figure, if it could be measured.

Brown U. Div. of Engineering, Providence, R. I.
STRESS WAVE PROPAGATION IN LEAD, by S. R. Bodner and H. Kolsky. Technical rept. no. 6 on Contract Nonr-562(14). Jan 58, 34p. 13 refs.
Order from LC mi$3.00, ph$6.30 PB 138 440

Mechanical behavior of pure lead bars for sinusoidal vibrations and for stress pulse propagation was investigated. Damping in lead is approximately independent of frequency and is amplitude dependent for large strains while the sound velocity increases slowly with frequency.

Columbia U., New York.
VIBRATIONS AND STABILITY OF PLATES UNDER INITIAL STRESS, by G. Herrmann and A. Armenakas. Technical note no. 1 on Contract AF 49(638)430. Feb 59, 57p. 14 refs. CU-2-59-AF-430-CE; AFOSR-TN-59-189; AD-211 220.
Order from LC mi$3.60, ph$9.30 PB 140 061

Several linear theories of motion of elastic plates are established which in addition to initial membrane forces take into account initial moments and transverse shear forces. It was found that a plate may

buckle under a uniform initial transverse shear force in a similar fashion as under initial compression.

Illinois U., Urbana.
BUCKLING OF AXIALLY COMPRESSED CYLINDRICAL SHELLS SUBJECTED TO INTERNAL PRESSURE, by H. L. Langhaar and A. P. Boresi. Rept. on Contract N6ori-071(53). July 57, 42p. 13 refs. T & AM rept. no. 121.
Order from LC mi$3.30, ph$7.80 PB 134 682

This report treats the buckling and post-buckling behavior of a cylindrical shell that is subjected to an axial compression force F and internal pressure p. The ends of the shell are assumed to provide simple support to the cylindrical wall. Accordingly, the radial and circumferential components of displacement of the middle surface of the wall vanish at the ends. The end plates of the shell are considered to be free to warp, so that no other constraint is imposed on the deformation. Only geometrically perfect shells are studied; that is, initial dents and out-of-roundness are not taken into consideration. Also, only perfectly elastic shells are considered; the effect of yielding is not taken into account. The axial force F is assumed to predominate, so that the buckled shell assumes a form in which diamond-shaped facets occur.

Notre Dame U., Ind.
THE EFFECT OF TEXTURE ON THE MECHANICAL PROPERTIES OF BERYLLIUM-COPPER WIRE, by August Freda (U. of Pittsburgh) and B. D. Cullity. Technical rept. no. 6 on Contract N7onr-439(05). June 58, 9p. 1 ref.
Order from LC mi$1.80, ph$1.80 PB 139 964

The mechanical properties and preferred orientation of beryllium-copper wire were investigated as a function of cold work, annealing, and aging. Recrystallization and grain growth decrease the ration of the torsional yield strength to the tensile strength. At the same time the proportion of the <111> component in the double <111> + <100> fiber texture increases. The change in mechanical properties with change in texture is in the direction one would predict from a consideration of the resolved shear stress imposed on the slip planes by torsional or tensile loading.

Polytechnic Inst. of Brooklyn, N. Y.
STRESS DISTRIBUTION IN BEAMS OF THIN-WALLED SECTIONS IN THE PRESENCE OF CREEP, by Sharad A. Patel and K. A. V. Pandalai. Rept. on Contract AF 49(638)302. Feb 59, 40p. 2 refs. PIBAL rept. no. 486; AFOSR TN-59-174; AD-211 314.
Order from LC mi$3.00, ph$6.30 PB 140 062

The cross sections considered are open sections with an axis of symmetry and circular sections with and without stringer reinforcements. In all these cases, the elastic analog is used to reduce the creep problem to one of nonlinear elasticity.

Polytechnic Inst. of Brooklyn, N. Y.
STRESS DISTRIBUTION IN MULTI-CELLULAR TORQUE BOXES DUE TO PRIMARY AND SECONDARY CREEP, by K. A. V. Pandalai and S. A. Patel. Rept. on Contract AF 49(638)302. Dec 58, 28p. 8 refs. PIBAL rept. no. 480; AFOSR TN-58-1074; AD-207 243.
Order from LC mi$2.70, ph$4.80 PB 138 510

Depending upon the geometry of the structure the stress distribution can differ appreciably from that given by linear theory, and the deformation caused by creep can be significant.

METALLURGY

Brown U. Div. of Engineering, Providence, R. I.
NON-ISOTHERMAL PLASTIC DEFORMATION, by W. Prager. Technical rept. no. 4 on Contract Nonr-562(20). Nov 57, 12p. 4 refs.
Order from LC mi$2.40, ph$3.30 PB 136 747

A theoretical discussion of strains in structural metals at elevated temperatures.

General Electric Co.
FLOW METERING OF MOLTEN LEAD-BISMUTH EUTECTIC AT UNIVERSITY OF CALIFORNIA, by R. A. Seban, W. T. Schrank, and D. Bartz. Rept. on Subcontract to Contract NObs-45468. 25 Apr 49, 11p.
Order from LC mi$2.40, ph$3.30 PB 130 330

Flow metering of lead-bismuth eutectic by means of sharp edged orifices and by an electromagnetic flow meter. As a result of this experience, the double pipe heat exchanger system, now completed, contains sharp edged orifices and inverted manometers as the metering elements.

Massachusetts Inst. of Tech., Cambridge.
OBSERVATIONS ON THE EFFECT OF SOLUTION RATE DURING LIQUID PHASE SINTERING, by Leonard P. Skolnick. Doctoral thesis. Technical rept. no. 6 on Contract Nonr-1841(24). June 58, 16p. 14 refs.
Order from LC mi$2.40, ph$3.30 PB 139 871

This study has indicated the reason for the rather unique microstructure of WC-Co: both in size and shape. A low solid-liquid surface energy, necessary for a well dispersed solid phase, suggests rather extensive solubility. If the solubility is high, a slow phase boundary reaction may be the only effective method for limiting the growth that occurs during liquid phase sintering.

Materials Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
MECHANICAL PROPERTIES OF AM350 AND AM355 STAINLESS STEELS, by Alton W. Brisbane. Rept. for Jan 56-Jan 57 on Materials Analysis and Evaluation Techniques. Feb 59, 53p. 2 refs. WADC Technical rept. 58-672; AD-208 664.
Order from OTS $1.50 PB 151 706

Investigation of two stainless steels AM-350 and AM-355, at several heat treatments and test condition. Tensile, compression, bearing, bending and charpy V-notched impact data were obtained. These materials were given several heat treatments to determine the effect on mechanical properties. Varying the aging temperatures and some effect on the strength properties and ductility. The -100°F +950°F heat treatment gave the best ductility. The sub-zero treatment with no elevated temperature aging gives the maximum strength but not the best ductility.

Michigan U., Ann Arbor.
NOTCH SENSITIVITY OF HEAT-RESISTANT ALLOYS AT ELEVATED TEMPERATURES. PART I. PRELIMINARY STUDIES OF THE INFLUENCE OF RELAXATION AND METALLURGICAL VARIABLES, by Howard R. Voorhees and James W. Freeman. Rept. on Design and Evaluation Data for Structural Metals, Contract AF 18(600)62. Aug 54, 111p. 14 refs. WADC Technical rept. 54-175, Pt. 1; AD-45 580.
Order from LC mi$6.00, ph$18.30 PB 140 005

Additional data for three alloys with conventional heat treatments: S-816 at 1350°F, Waspaloy at 1500°F, Inconel X-550 at 1350°F. Test results included stress-rupture time properties, short-time tensile properties, and creep properties when stresses were changed from one level to another during a test. Cold working had the greatest effect on notch sensitivity of the several conditions investigated, but no severe case of notch weakening was observed for either S-816 at 1350° and 1500°F, or for Waspaloy at 1500°F in the limited number of tests.

National Bureau of Standards, Washington, D. C.
OXIDATION OF EXPERIMENTAL ALLOYS, by Joseph C. Richmond and H. Richard Thornton. Rept. for 1 Apr 57-31 May 58 on General Electric Cycle Aircraft Nuclear Propulsion Subsystem for System Development, Contract AF 33(616)56-19. Feb 59, 19p. WADC Technical rept. 58-164, pt. 2; AD-209 379.
Order from OTS $0.50 PB 151 741

A study was made of the oxidation resistance of five newly developed high-temperature alloys. Test included the measurement of the average depth of external oxidation and maximum depth of oxide penetration on specimens that had been subjected to stress in air under fluctuating-temperature conditions for an equivalent length of time. The weight change of specimens oxidized in air at high temperatures was continuously recorded for periods up to 100 hours. The depth of oxide penetration was found to increase with temperature and with stress. There was little effect of stress at stresses below that required to produce one percent extension in 100 hours. All of the alloys conformed reasonably well to the parabolic rate law in the weight-gain oxidation tests.

Nepa Div., Fairchild Engine and Airplane Corp., Oak Ridge, Tenn.
DEVELOPMENT OF APPARATUS AND METHODS FOR MEASUREMENT OF CREEP TO TEMPERATURES OF 3500 DEGREES F, by M. J. Sinnott, W. R. Kressel and others. Final rept. 15 Aug [50] 193p. 11 refs. NEPA-1560; AD-156 204.
Order from LC mi$8.70, ph$30.30 PB 139 935

Portions of this report are illegible. The design of the extensometer system for the measurement of creep at temperatures to 3500°F is presented. Designs for furnaces to operate, with the extensometer system developed, under oxidizing test conditions to temperatures of 3500°F are presented. Two new methods for the measurement and control of high temperatures have been developed. One utilizes a Geiger-Muller tube as a detector and the other a Photo-Electron-Multiplier tube.

Pitmann-Dunn Labs. Group, Frankford Arsenal, Philadelphia, Pa.
THE ELECTRODEPOSITION OF MANGANESE ALLOYS: A LITERATURE SURVEY, by E. L. MacNamara. Sep 56, 28p. 62 refs. Rept. no. R-1350.
Order from LC mi$2.70, ph$4.80 PB 129 498

Manganese has been considered a substitute for zinc and cadmium, but it has been reported as being inferior to either of these metals. Where appearance is important, it cannot be used effectively because it tarnishes quickly with a rapid collection of brown oxidation products.

[Science and Technology Div.] Library of Congress, Washington, D. C.
THERMAL PROPERTIES OF CERTAIN METALS. PART II. IRON, BERYLLIUM, IRIDIUM, PALLADIUM, PLATINUM, AND TUNGSTEN, by Thomas C. Goodwin, Jr. and Mauree W. Ayton. Rept. for 1 July 56-31 Dec 57 on Contract AF 33(616)55-10. Sep 58, 321p. 416 refs. WADC Technical rept. 56-423, Pt. 2; AD-157 169.
Order from OTS $5.00 PB 151 679

The bibliography on the thermal properties of certain metals consists of references, with abstracts, to pertinent open literature published from 1920 to 1957, and to unclassified reports issued from about 1944 to 1957. These references were obtained by a comprehensive search of the sources listed in the Introduction. The material included in the bibliography pertains to various thermal properties, namely, heat capacity, thermal conductivity, emissivity, thermal diffusivity, and thermal expansion of iron (pure), beryllium, iridium, rhodium, palladium, platinum, and tungsten.

Utah U., Salt Lake City.
KINETICS OF OXIDATION OF METAL POWERS, by H. Edward Flanders. Technical rept. no. 1 on Contract DAI 04-495-501-ORD(P)-19. 1 Aug 56, 30p.
Order from LC mi$2.70, ph$4.80 PB 128 568

Rate of oxidation of Mg, Al, Zr, and alloy powders of various screen sizes at 550° C.

Watertown Arsenal Labs., Mass.
AUTOMATIC IMPACT TESTING TO 8 DEGREES, K, by Thomas S. DeSisto. Rept. on Low-Temperature Impact Testing. July 58, 25p. 4 refs. WAL TR-112/93.
Order from LC mi$2.70, ph$4.80 PB 140 262

Using liquid nitrogen and liquid helium as coolants, Charpy V notch impact tests have been conducted from room temperature to 8°K in an automatic device, which houses within a vacuum a complete impact machine and storage space for 105 specimens. Low-temperature impact data on AISI 4340 steel, commericially pure titanium, and three titanium alloys are presented. Commercially pure titanium exhibits remarkable toughness at 10°K.

Westinghouse Electric Corp. [Lester, Pa.]
DEVELOPMENT OF NIOBIUM-BASE ALLOYS, by Richard T. Begley. Rept. on Metallic Materials for 1 June 57-1 June 58, Contract AF 33(616)3316. Mar 59, 192p. 98 refs. WADC Technical rept. 57-344, Pt. 2; AD-210 258.
Order from OTS $3.00 PB 151 739

Flow and fracture studies indicate that the ductile to brittle transition of niobium is little affected by oxygen content in the range 0.01 to 0.1% 0_2. Strain-hardening and strain aging in niobium were studied. The recrystallization behavior of electron-beam melted niobium was studied in detail. Creep-rupture data were obtained on electron-beam melted niobium at (871 C) 1600 F and (982 C) 1800 F. The effect of temperature on the modulus of elasticity of niobium and tantalum was determined in the range 25 C to 900 C. Studies of the thermodynamics of niobium oxides and the kinetics of Nb-water vapor reaction were carried out. The thermodynamic functions obtained in this study for the formation of Nb_2O_5 from Nb_2O_4 are in excellent agreement with calculated values. A selection of the most promising weldable niobium-base alloys was made on the basis of available physical and mechanical property data. Niobium of low oxygen and nitrogen content was produced by cage-zone and floating zone melting techniques. Evaluation of material prepared by electron-beam melting and vacuum arc melting was carried out.

Ferrous Metals

Cryogenic Lab., Ohio State U. Research Foundation, Columbus.
THERMAL CONDUCTIVITY OF METALS AND ALLOYS AT LOW TEMPERATURES. II. DATA ON IRON AND SEVERAL STEELS BETWEEN 25° AND 300°K. INFLUENCE OF ALLOYING CONSTITUENTS, by Robert W. Powers, John B. Ziegler, and Herrick L. Johnston. Technical rept. 6 on Liquid Hydrogen as an Aircraft Fuel, Contract W33-038-ac-14794. 25 Apr 51, declassified 6 Apr 54, 22p. 11 refs. TR 264-6; ATI-105 923.
Order from LC mi$2.70, ph$4.80 PB 139 747

The thermal conductivities of pure iron and of a number of commercially important steels have been measured for the temperature range 25° - 300°K. It is found that the low temperature maximum observed for pure iron at about 30°K is lowered, broadened, and moved to higher temperatures by the addition of increasing amounts of alloying agents. These findings are interpreted on the basis of theories developed by Grüneisen and Makinson.

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
HYDROGEN EXTRACTION APPARATUS: CONSTRUCTION AND OPERATION, by J. D. Walton. Rept. no. 1 on Contract NObs-72209. Dec 56, 18p.
Order from LC mi$2.40, ph$3.30 PB 140 107

This project is concerned with hydrogen extraction from steel.

Istituto Elettrotecnico Nazionale "Galileo Ferraris" (Italy).
EFFECT OF NEUTRON BOMBARDMENT ON THE MAGNETIC PROPERTIES OF IRON, by Giuseppe Biorci, Guido Bonfiglioli and others. Technical note no. 1b on Study of the Effect of Radiation Damage on Magnetic Properties of Ferromagnetic Materials, Contract AF 61(514)1331. Sep 58, 49p. 48 refs. AFOSR TN-58-1096; AD-207 597.
Order from LC mi$3.30, ph$7.80 PB 138 781

Specimens of commercial iron have been irradiated with fast neutrons. The results on magnetic properties confirming that the internal stresses introduced by irradiation are very weak, further support the hypothesis that the increase in strength of irradiated metals is mainly due to some mechanism of anchoring of the dislocations by the point defects produced during the irradiation itself.

Naval Research Lab., Washington, D. C.
CHARPY-V TRANSITION TEMPERATURES OF FERRITIC IRON ALLOYS. PART I. IRON-OXYGEN AND IRON-ALUMINUM, by J. E. Srawley. Final rept. pt. 1. 6 Apr 59, 19p. 18 refs. NRL rept. 5290.
Order from OTS $0.50 PB 151 555

The mid-energy Charpy-V transition temperatures of a series of iron-oxygen alloys and a series of iron-aluminum alloys have been determined for several conditions of mechanical working and heat treatment. The 50% ductile fracture-appearance transition temperatures were the same as the mid-energy temperatures for all practical purposes. The transition temperature of iron increased steadily with the oxygen content for any given condition among those studied. For a given oxygen content the transition temperature was higher if the material had been furnace cooled from 1650°F after being cold worked than if it had been oil quenched from 1650°F after cold working. The mode of fracture below the transition temperature was intergranular for annealed irons containing 0.0039% oxygen or more, and transgranular for quenched irons containing 0.0206% oxygen or less. In iron-aluminum alloys the mode of fracture below the transition temperature was invariably transgranular. In contrast with the iron-oxygen series, the transition temperatures and hardnesses were higher in the quenched condition than in the annealed condition.

Ohio State U. Research Foundation, Columbus.
DEVELOPMENT OF NEW MECHANISMS AND TECHNIQUES FOR OBTAINING STEELS IN THE ULTRA-HIGH STRENGTH RANGE, by Damian Gullotti, Erwin Eichen, and Joseph W. Spretnak. Rept. for 1 Mar 55-31 Aug 56 on Metallurgy and Metallic Materials, Contract AF 33(616)2879. May 57, 56p. 76 refs. WADC

Technical rept. 56-555; AD-130 755.
Order from OTS $1.50 PB 131 238

Two possible methods of obtaining steels in the high strength range were investigated, namely, the superimposition of plastic deformation on the transformation of austenite to martensite, and the production of high nitrogen-low carbon (0.25% maximum) martensite. In the deformation of austenites prior to transformation, increases in tensile strength up to 10% and Si-1.60, Mn 0.75, Cr-1.40, increasing the nitrogen content from 0.004 to 0.009% increased the 0.2% offset yield strength about 6% and the tensile strength about 3.5%. The ductility was essentially unaffected by this increase in nitrogen content.

Light Metals

Brown U., Providence, R. I.
CORROSION AND PASSIVITY STUDIES WITH TITANIUM, by H. E. Farnsworth, R. E. Schlier, and T. H. George. Final technical rept. for 1 July 52-30 Sep 55 on Contract DA 19-020-ORD-1816. 30 Sep 55, 96p. 12 refs. WAL 401/143-11; AD-72 796
Order from LC mi$5.40, ph$15.30 PB 140 087

Contents:
Chemisorption of oxygen and nitrogen on titanium
Structure of epitaxed copper deposited by evaporation onto the (00·1) face of a titanium single crystal
Secondary electron emission from the titanium crystal, and from the copper-covered titanium crystal
Ion bombardment-cleaning of germanium and titanium as determined by low-energy electron diffraction

Cryogenic Lab., Ohio State U. Research Foundation, Columbus.
THERMAL CONDUCTIVITY OF METALS AND ALLOYS AT LOW TEMPERATURES. III. DATA FOR ALUMINUM ALLOYS BETWEEN 25° AND 300°K, by Robert W. Powers, John B. Ziegler, and Herrick L. Johnston. Technical rept. 6 on Liquid Hydrogen as an Aircraft fuel, Contract W33-038-ac-14794. [1951] declassified 6 Apr 54, 17p. 5 refs. TR 264-7; ATI-105 924.
Order from LC mi$2.40, ph$3.30 PB 139 750

The thermal conductivity of the aluminum alloys J 51, 4 S, 24 S, and 75 S were measured from 25° to 300°K. It is observed that the addition of alloying agents to pure aluminum influences the maximum in the thermal conductivity curve in the same manner as was observed for the iron system. In addition to the maximum we have observed a minimum, at 140° K, in the thermal conductivity of J 51 aluminum, in line with the theory of Makinson.

Cryogenic Lab., Ohio State U. Research Foundation, Columbus.
THERMAL CONDUCTIVITY OF METALS AND ALLOYS AT LOW TEMPERATURES. IV. DATA ON CONSTANTAN, MONEL, AND CONTRACID BETWEEN 25° AND 300°K, by Robert W. Powers, John B. Ziegler, and Herrick L. Johnston. Technical rept. 8 on Liquid Hydrogen as an Aircraft Fuel, Contract W33-038-ac-14794. 30 Apr 51, declassified 6 Apr 54, 16p. 11 refs. TR 264-8; ATI-105 925.
Order from LC mi$2.40, ph$3.30 PB 139 751

The thermal conductivity of constantan, monel (both hot and cold-rolled) inconel, and contracid between 25° K and room temperature are reported.

[Defense Metals Information Center] Battelle Memorial Inst., Columbus, Ohio.
COMPILATION OF AVAILABLE INFORMATION ON THE Ti-7Al-(3-4)Mo ALLOY, by R. W. Douglass and F. C. Holden. Memorandum. 18 July 58, 99p. 23 refs.
Order from OTS $2.25 PB 151 322

Ti-7Al-(3-4)Mo is a bar and forging alloy designed for use in elevated-temperature applications and as high-strength forgings. Recommended practices in production and fabrication are included, and the information presented may be considered as typical of current practice.
Contents:
Physical properties
Physical metallurgy
Heat treatment
Effect of composition
Forming
Elevated-temperature properties
Mechanical properties
Corrosion
Welding
Machining

Horizons, Inc., Cleveland, Ohio.
ELECTROLYTIC PROCESS FOR THE PRODUCTION OF TITANIUM METAL, by Bertram C. Raynes. Final rept. for 26 June 56-31 Oct 57 on Contract NOas 56-827-c. Dec 57, 127p. 10 refs.
Order from LC mi$6.30, ph$19.80 PB 135 917

Titanium metal scrap containing substantial amounts of metallic and non-metallic impurities can conveniently be used as the soluble anode in fused salt systems to produce high purity titanium metal. Development work on the TiC soluble anode process demonstrated that additional laboratory work will be required. Experimentation aimed to develop more suitable soluble anode feed materials for fused salt electrolytic production of titanium.

Massachusetts Inst. of Tech., Cambridge.
X-RAY DETERMINATION OF BETA PHASE IN TITANIUM ALLOYS, by M. F. Comerford, B. L. Averbach, and M. B. Bever. Technical rept. no. 1 on Contract Nonr-1841(02). 31 Jan 58, 15p. 10 refs.
Order from LC mi$2.40, ph$3.30 PB 138 443

The volume percent of β phase was determined in a titanium alloy of the type Ti-6Al-4V by measurements of integrated diffraction intensities. The β appears to form by a decomposition of the martensitic α' phase in this alloy.

North American Aviation, Inc., Downey, Calif.
STATUS OF TITANIUM ALLOY RESEARCH AND DEVELOPMENT PROGRAM. Progress rept. no. 13, on Contract AF 33(600)28649. June 55, 95p. 15 refs. Rept. no. AL-2064-12; AD-80 652.
Order from LC mi$5.40, ph$15.30 PB 135 550

Contents:
Ti-2Al-4V
Ti-4Al-4V
Ti-6Al-4V
8Mn-Ti-Alloy
RC-A110 AT
Titanium bolt program
Fabrication
Resistance welding
Fusion welding
Titanium vacuum annealing
Bibliography

Nonferrous (except light) Metals

Brush Beryllium Co., Cleveland, Ohio.
DEVELOPMENT OF WROUGHT BERYLLIUM ALLOYS OF IMPROVED PROPERTIES, by John G. Klein, Leslie M. Perelman, and Wallace W. Beaver. Rept. for 5 July 57-4 July 58, on Atlas Materials and on Metallic Materials, Contracts AF 33(616)57-19 and AT(30-1)541. Feb 59, 154p. 48 refs. WADC Technical rept. 58-478, Pt. 1; AD-208 663. 154
Order from OTS $3.00 PB 151 711

A review of the literature on alloying and other structural modifications and their effect on mechanical properties of beryllium is included in this report. Primary consideration is given to mechanical and physical properties of QMV beryllium, both sintered and wrought, beryllium-rich alloys, and structurally modified metal; fabrication procedures are described. A discussion of background and methods used to study preferred crystallographic orientation in wrought beryllium is appended.

Cryogenic Lab., Ohio State U. Research Foundation, Columbus.
THERMAL CONDUCTIVITY OF METALS AND ALLOYS AT LOW TEMPERATURES. I. APPARATUS FOR MEASUREMENTS BETWEEN 25° AND 300°K. DATA ON PURE ALUMINUM, OFHC COPPER, AND "L" NICKEL, by Robert W. Powers, Daniel Schwartz, and Herrick L. Johnston. Technical rept. 5 on Liquid Hydrogen as an Aircraft Fuel, Contract W33-038-ac-14794. [1950] declassified 6 Apr 54, 26p. 9 refs. TR 264-5; ATI-105 928.
Order from LC mi$2.70, ph$4.80 PB 139 749

An apparatus is described wherein the thermal conductivity of metals and alloys can be measured from about 25° to 300° K by using small temperature increments. Data on pure aluminum, OFHC copper, and "L" nickel are presented.

Illinois Inst. of Tech., Chicago.
A CALORIMETRIC STUDY OF ORDER IN AU_3CU, by Francois d'Heurle and Paul Gordon. Technical rept. no. 1 on Contract Nonr-1406(03). July 58, 35p. 30 refs.
Order from LC mi$3.00, ph$6.30 PB 140 268

Changes of internal energy associated with ordering in 72.5 at. % Au and 27.5% at . % Cu lead to a ΔH value of -310 calories per mole between a perfectly ordered and a perfectly disordered sample as measured at 194°C. The critical temperature has been determined to be 209 ± 2°C.

Illinois U., Urbana.
THE KINETICS OF FORMATION OF A METASTABLE PHASE IN NON-EQUILIBRIUM SOLID SOLUTIONS OF GOLD AND NICKEL, by James Cost. Rept. on Contract AF 18(603)22. [1958] 49p. 17 refs. AFOSR TN-59-56; AD-209 427.
Order from LC mi$3.30, ph$7.80 PB 139 829

This paper continues the investigation of the Au-Ni solid solutions at temperatures below 315°C to determine the deviation of the solid solution from randomness in this temperature region. The effects of various heat treatments on the hardness and internal friction of the alloy were studied and metallographic study using electron microscopy and x-ray analysis was made.

National Research Corp., Cambridge, Mass.
OXIDATION RESISTANT COATING FOR MOLYBDENUM, by Paul L. Raymond. Final rept. on Contract NOas-56-481-c. 8 Jan 58, 21p. 3 refs.
Order from LC mi$2.70, ph$4.80 PB 140 114

For imparting high-temperature oxidation resistance to sintered bodies produced from molybdenum powders, equipment was constructed to coat the surface of powder grains with oxidation-resistant materials. Samples produced to date have not shown appreciable oxidation resistance.

Politecnico di Milano (Italy).
ELECTROCHEMICAL BEHAVIOR OF NICKEL, by Giovanni Serravalle. Technical note no. 11 on Contract AF 61(514)733c. Dec 57, 29p. 6 refs. AFOSR TN-58-237; AD-154 139.
Order from LC mi$2.70, ph$4.80 PB 135 228

This paper concerns the electrochemical behavior, cathodic and anodic, the passivation phenomena and passivity conditions of nickel in aqueous solutions of various nickel salts at different pH, temperature and current density.

Sarah Mellon Scaife Radiation Lab., U. of Pittsburgh, Pa.
VALENCE BAND STRUCTURE OF BeO, by William J. O'Sullivan. Doctoral thesis. Technical note on Contract AF 49(638)323. May 58, 83p. 19 refs. AFOSR TN-58-474; AD-158 285.
Order from LC mi$4.80, ph$13.80 PB 135 153

Using the tight binding approximation, a representation of the valence band of BeO for certain directions in the wurtzite brillouin zone (BZ) has been determined. Only

the single configuration $Be(1s)^2\ 0(2p)^6$ is considered in the calculation, and as a result of this the ionic character of the crystal has been overemphasized.

Structural Metallurgy and Corrosion

Aberdeen Proving Ground, Md.
DEVELOPMENT OF A SUITABLE LABORATORY BENCH CORROSION TEST FOR ANTIFREEZE COMPOUNDS AND INHIBITORS, by M. Levy and C. F. Pickett. Rept. no. 15 on Ordnance Proj. no. TB5-8010A. 26 Feb 54, 46p. Lab. Service Div. rept. no. 205.
Order from LC mi$3.30, ph$7.80 PB 139 412

A simple stationary type laboratory glassware corrosion test was devised which measured corrosiveness of antifreeze compounds and inhibitors by gravimetrically determining weight losses per unit area of metal test strips and interpretation of physical and chemical properties of test solutions. Various inhibitors were tested in 100% distilled water, 100% ethylene glycol, and 50% distilled H_2O -, 50% ethylene glycol solutions. Antifreeze compounds were also tested as packaged or in dilution of 33-1/3% by volume. The same materials were tested in the simulated vehicle cooling system and corrosion ratings were given to each material. A comparison of the corrosion ratings of the two test methods was made.

Columbia U. School of Mines, New York.
GRAIN BOUNDARY STRESS RELAXATION AND SLIDING: SOLUTES AND INTERACTIONS. Rept. on Contract AF 18(600)965. [1958] 17p. 9 refs. AFOSR TR-58-123; AD-202 924.
Order from LC mi$2.40, ph$3.30 PB 139 821

Grain boundary migration and grain boundary sliding may be two processes with the former controlling in pure metals and the latter in alloys. Voids were produced along the bicrystal boundaries subjected to sliding at elevated temperatures. The number of voids produced depended upon the amount of grain boundary sliding. Internal friction measurements can reveal the relative adsorbability of solutes at grain boundaries.

Horizons, Inc., Cleveland, Ohio.
INVESTIGATION OF THE CORROSIVE COMPONENT OF MECHANICAL WEAR, by R. H. Baskey. Final progress rept. on Contract AF 18(600)1589. 1 May 58, 110p. 15 refs. AFOSR-TR-58-73; AD-158 313.
Order from LC mi$5.70, ph$16.80 PB 135 624

Controlled experiments under sliding conditions of wear have been made of the corrosive wear component as a function of load, distance of travel, and sliding velocity over a given area when using a mildly corrosive lubricant containing 90% butyl cellosolve-10% water. Wear rate (cc/cm) was measured on steel and brass. An empirical equation was evolved for the volume of wear produced.

Naval Engineering Experiment Station, Annapolis, Md.
CORROSION OF MATERIALS IN HIGH TEMPERATURE WATERS, by C. J. Lancaster and W. L. Williams. 9 Feb 54. 24p. 5 refs. EES. rept. 040028F.
Order from LC mi$2.70, ph$4.80 PB 139 923

Results are reported on laboratory experiments dealing with stress-corrosion cracking of austenitic stainless steels in boiler water environments. Navy boiler water treatment inhibits cracking in materials submerged in the water. However, the treatment is not effective with materials above the liquid level. Cracking could be produced easily in the vapor phase at water temperatures, water compositions, and material stress levels of practical interest. The demonstration consisted of an Inspection and location of cracks in a stainless steel boiler used for hotel services.

NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

Air Force Cambridge Research Center, Bedford, Mass.
NATURAL AEROSOLS AND NUCLEAR DEBRIS STUDIES, by P. J. Drevinsky, C. E. Junge and others. Progress rept. no. 1 on Contract AT (49-7)431. Sep 58, 50p. 16 refs. GRD Research Notes no. 8; AFCRC-TN-58-652; AD-209 539.
Order from OTS $1.25 PB 151 731

A program of research on radioactive and inactive aerosols in the atmosphere is described. Preliminary results on the size distribution of particulate aerosols of the troposphere and stratosphere are presented. Results of measurements of Sr^{90} in polar snow cores and Sr^{90}, Ba^{140} and other fission products in precipitation and in stratospheric air are presented. These and related topics will be discussed more comprehensively in subsequent reports, semiannually.

California U., Berkely.
SHORT-TIME CONTROL OF CLOUD CHAMBER SENSITIVITY FOR USE WITH PARTICLE ACCELERATORS, by Hans W. J. Courant. Technical rept. 36 on Cosmic Rays, Contract Nonr-222(40). [1956] 6p. 1 ref.
Order from LC mi$1.80, ph$1.80 PB 139 961

Institute of Mathematical Sciences, New York U., N. Y.
EFFECTIVE TWO-BODY METHOD FOR TWO-ELECTRON ATOMS, by S. I. Rubinow. Rept. on Contract AF 19(604)4555. Feb 59, 21p. 10 refs. Research rept. on. CX-39; AFCRC-TN-59-239; AD-211 159.
Order from LC mi$2.70, ph$4.80 PB 139 731

Possibilities of obtaining in a simple manner approximate solutions of the bound two-electron atomic system are investigated. In particular, an effective two-body method is studied. It consists essentially of the assumption of a simple functional form for the wave function. The resulting Schrödinger equation may be

solved exactly, yielding upper bounds of all the eigenvalues of the system. Only the lowest approximate eigenvalue is near to the exact result.

Institute of Mathematical Sciences, New York U., N. Y.
NON-ADIABATIC TREATMENT OF ELASTIC SCATTERING OF ELECTRONS BY ATOMIC HYDROGEN, by Kazem Omidvar. Rept. on Contract AF 19(604)4555. Jan 59, 53p. 23 refs. Research rept. no. CX-37; AFCRC-TN-59-248; AD-211 495.
Order from LC mi$3.60, ph$9.30 PB 139 971

The elastic scattering of electrons by atomic hydrogen including the effects of exchange and polarization is calculated. To include the exchange effect the total spin and space function of the incident and the bound electrons is made antisymmetric with respect to interchange of the two electrons. In this way an equation for the wave function of the incident electron similar to the Fock equation is obtained.

Naval Research Lab., Washington, D. C.
TABLE OF (p, γ) RESONANCES, by J. W. Butler. 9 Apr 59, 22p. 123 refs. NRL rept. 5282.
Order from LC mi$2.70, ph$4.80 PB 138 027

In measuring the (p, γ) excitation curve for a new target isotope, one very often encounters resonances which are not due to the target nuclide but are caused by a contaminant. To facilitate the identification of such contaminants, a table of all known resonances has been compiled which gives in successive columns the proton energy (there are 443 table entries, starting at 163 kev and extending to 3 Mev), the reaction, the energies of the emitted gamma rays, the cross section, the resonance width, and references to the original literature. Since the (p, $\alpha\gamma$) reactions on N^{15} and F^{19} lead to gamma rays in the binding energy region, and since these cross sections are very large, they have been included in the table. One resonance in the Be^{9} (p, $\alpha\gamma$) reaction has also been included. The approximate cutoff date of the data presented is July 1958.

New Mexico U., Albuquerque.
DEVELOPMENT OF A LARGE SCINTILLATOR FOR OBSERVATION OF EXTENSIVE AIR SHOWERS, by John R. Green. Preliminary rept. on Contract AF 49(638)34. June 57, 6p. AFOSR TN-57-432; AD-136 422.
Order from LC mi$1.80, ph$1.80 PB 135 087

A large scintillator has been constructed for the purpose of investigating high energy extensive air showers of the cosmic radiation.

Sarah Mellon Scaife Radiation Lab., U. of Pittsburgh, Pa.
THE DETERMINATION AND INTERPRETATION OF NUCLEAR RADII BY NEUTRON SHAPE ELASTIC SCATTERING, by Kamal Kishore Seth. Doctoral thesis. Technical rept. no. 8 on Precision Scattering on Nuclear Particles, Contract N7onr-325(05). Aug 57, 175p. 81 refs. AD-140 581.
Order from LC mi$8.10, ph$27.30 PB 140 099

In this thesis it is proposed to examine the concept of a 'nuclear radius', to present results of investigations of nuclear radii made by accurate determinations of neutron shape elastic (or what is more commonly known as 'potential scattering') cross section, and to discuss the interpretation of such results in the light of other experiments which are employed to determine nuclear radii. Contents include: The concept of the nuclear radius, the nuclear models, apparatus and experimental procedures, theory and methods of analysis, results of the experiments, survey of the results of various experiments measuring nuclear radii, the B. N. L. fast chopper and the associated equipment, the 1024 channel time of flight analyser.

Washington U., St. Louis, Mo.
NUCLEAR PHYSICS. Final rept. for 1 Feb 55 - 31 Jan 57 on Contract Nonr-816(07). 24 June 58, 7p. 15 refs.
Order from LC mi$1.80, ph$1.80 PB 139 876

A brief summary of accomplishments.

Elementary Particles

Institute of Mathematical Sciences, New York U., N. Y.
INVESTIGATION OF IONOSPHERIC PARTICLE INTERACTION. Final rept. on Contract AF 19(604)1705. Nov 58, 13p. 43 refs. AFCRC TR-59-206.
Order from LC mi$2.40, ph$3.30 PB 139 860

Contains brief summary of work done thus far.

New York U., N. Y.
FINAL REPT. ON CONTRACT N6onr-279(13). Rept. for 15 June 50-30 June 56; 3p. 8 refs.
Order from LC mi$1.80, ph$1.80 PB 139 968

The major problems studied during the period of the contract were: Time lags in gas-filled particle detectors, Parallel plate spark counters, and Large volume scintillation counters.

Palmer Physical Lab., Princeton U., N. J.
A CLOUD CHAMBER INVESTIGATION OF NEUTRAL STRANGE PARTICLES, by Judson Hardy, Jr. Doctoral thesis. Technical rept. no. 19 on Contract Nonr-1858(06). 2 June 58, 89p. 15 refs.
Order from LC mi$4.80, ph$13.80 PB 139 883

Part 1. Production experiment: angular distributions in λ decay
Part 2. Mean lifetime of θ^{0}_{2}

Stanford University, Stanford, Calif.
ELECTRON-DEUTERON SCATTERING BY THE IMPULSE APPROXIMATION, by A. Goldberg. Technical rept. no. 35 on Contract AF 18(600)545. June 58, 21p. 10 refs. AFOSR TN-58-536; AD-158 352.
Order from LC mi$2.70, ph$4.80 PB 135 413

The cross section for inelastic scattering of high-energy electrons by deuterons is calculated using the impulse approximation. The results agree with those of Jankus. The cross sections are given for several neutron charge and moment distributions. The peak cross sections are simply related to the free-nucleon cross sections with this approximation.

Instruments and Installations

Army Chemical Warfare Labs., Army Chemical Center, Md.
A GEIGER COUNTER FOR LARGE DIAMETER SOURCES, by Leonard Bird and John Kinch. Rept. for Jan 55-Nov 56 on Atomic Weapons Test. June 58, 17p. 4 refs. CWLR 2222.
Order from OTS $0.50 PB 151 321

A Geiger Müller counter of the flow type with a 4-3/4 inch diameter window is described. The adaptation of this counter to 4π counting is discussed. It is concluded that the counter described is suitable for counting large area sources up to 4 inches in diameter and can be adapted to 4π counting.

Naval Radiological Defense Lab., San Francisco, Calif.
GLOVE BOX AND ASSOCIATED EQUIPMENT FOR THE REMOVAL OF RADIOACTIVE FALLOUT FROM HEXCELL COLLECTORS, by A. E. Greendale and M. H. Honma. Rept. on Effects of Atomic Weapons. 1 May 57, 18p. Research and development technical rept. USNRDL TR-157.
Order from LC mi$2.40, ph$3.30 PB 140 276

A large glove box of improved design was developed to handle the new fallout sample collectors. The special operations necessary for the decontamination, which uses a distilled water spray method, are described in detail. A quardrijet air-water sprayer constructed for improved performance reduced the decontamination time for the hexcells. The multiple hot plates and individual air jets considerably reduced evaporation time for the fallout samples. The operations within the special box were carried out with reduced radiological hazards.

School of Aviation Medicine, Randolph AFB, Tex.
COMPARATIVE X-RAY DOSIMETRY, by Sanford C. Sigoloff, Loren C. Logie, and others. Jan 57, 5p. 6 refs. Rept. 56-109.
Order from LC mi$1.80, ph$1.80 PB 128 448

This paper presents the application of two technics—the Victoreen R-meter and a chemical dosimeter system—to obtain readings under properly filtered and improperly filtered x-ray exposure conditions. Both systems were NBS calibrated before experimentation. The x-ray source employed was a self-rectifying, half-wave, 260 kvp, 18 ma. therapeutic unit; filtration conditions were varied. Large discrepancies in the dose indications of the two dosimetric systems used point up the need for proper filtration in the employment of x-ray; several recommendations are discussed in detail.

University of Southern California, Los Angeles.
THE BETA-SPECTROMETER DESIGN INVESTIGATION, PARTS I AND II, by Stanley F. Fankel and Eldred C. Nelson. Preliminary rept. on Contract N6onr-238(05) June 48, 44p. 17 refs. AD-201 058.
Order from LC mi$3.30, ph$7.80 PB 139 989

Various types of instruments have been used to determine the energy distribution of the electrons (positive or negative) emitted by a radioactive sample. All such instruments will here be referred to as β-spectrometers if they serve to produce a spatial separation of the components of the β-ray beams by the use of electrostatic and/or magnetic fields. The engineering considerations affecting the design of a β-spectrometer differ considerably from those of a mass spectrometer. Only the former are considered here.

Nuclear Engineering and Power

Curtiss-Wright Corp., Clifton, N. J.
REACTOR ANALYTIC TECHNIQUES, by Devereux L. Kavanagh and William J. Roberts. June 58, 90p. 7 refs. CWR-400-3.
Order from LC mi$4.80, ph$13.80 PB 140 264

The nuclear analysis of reactor systems involve the study of many different system parameters. The theories applied are varied and, in several instances, seemingly contradictory in nature. Also, the analytical tools available are unfamiliar to most of those just entering the field. The purpose of this report is, to present some of the analyses required and at least one approach to the calculational aspects of each analysis. The report is merely an introduction to certain techniques used at one time or another at Curtiss-Wright.

Harvard Coll. Observatory [Cambridge, Mass.]
UTILIZATION OF THE ORBITAL RADIATION FROM ELECTRON SYNCHROTRONS: A LISTING OF PROSPECTIVE EXPERIMENTAL STUDIES, by D. H. Tomboulian and D. E. Bedo. Scientific rept. no. 5 on Calculations on the Average Power Spectrum of the Cambridge Electron Accelerator, Contract AF 19(122)482. 15 May 58, 14p. 12 refs. AFCRC TN-58-421; AD-152 591.
Order from LC mi$2.40, ph$3.30 PB 135 251

It is anticipated that the orbital radiation will be useful in two general areas of investigation. In one domain the measurements might be concerned with the characteristics of the radiant energy which would be of intrinsic interest to physical theory. In the second domain the studies would be such as to take advantage of such attributes as the high intensity, the continuous character, the high degree of polarization, and the predictable absolute intensity of this source.

Naval Research Lab., Washington, D. C.
MAN-MACHINE FACTORS IN THE NRL NUCLEAR REACTOR CONTROL SYSTEM, by H. J. Berliner and M. P. Young and G. F. Wall. 12 Mar 59, 23p. 1 ref. NRL rept. 5270.
Order from OTS $0.75 PB 151 732

One important problem in the design of a research reactor is the allocation of control responsibility among men and automatic equipment so as to achieve the maximum in safety, flexibility, and continuous operation. To meet these objectives, the design planning for the NRL Research Reactor control system included careful consideration of the relative advantages and limitations of men and machines for each of the required control functions. Man's ability as a general-purpose computer capable of dealing with low-probability alternatives is utilized to institute appropriate corrective action before automatic shutdown is enforced. To facilitate the operator's task, he has displays which provide him with continuous, concise information, and controls which allow prompt action on the basis of this information. Indicators which display equipment conditions on the outside of cabinets make diagnosis easier in case of equipment trouble. Replacement and maintenance are lightened by having plug-in type replacement chassis, nearby repair shops, and ample servicing access space.

Naval Research Lab., Washington, D. C.
TRANSIENT RESPONSE OF PLANE PARALLEL FUEL ASSEMBLIES TO EXPONENTIAL POWER EXCURSIONS, by S. E. Golian, T. A. Bergstralh and others. Jan 55, declassified 11 July 56. 69p. 84 refs. NRL rept. 4495.
Order from LC mi$3.90, ph$10.80 PB 139 970

An exploratory mathematical analysis is made of the thermal conditions resulting from the application of an exponential power excursion to a plane parallel type fuel element immersed in water. For excursion periods in the region of interest, below 30 milliseconds, the coolant is considered as completely stagnant until such time as boiling point temperatures are attained.

Quartermaster Research and [Engineering] Center, Natick, Mass.
PERFORMANCE OF ROTATING SHUTTERS FOR THE QM ARC, by Raymond D. Cooper. 25 Apr 56, 15p. 3 refs. Special Projects Branch rept. T-9; AD-140 361.
Order from LC mi$2.40, ph$3.30 PB 136 756

Nuclear Reactions

California U., Berkeley.
RELATIVISTIC INCREASE OF IONIZATION IN HELIUM, by T. L. Aggson, W. B. Fretter, and others. Technical rept. 35 on Cosmic Rays, Contract Nonr-222(40). [1956] 12p. 17 refs.
Order from LC mi$2.40, ph$3.30 PB 138 486

The relative probable ionization in helium has been measured for singly-charged particles of $\beta\gamma$ from 4 to 70 with π-mesons and for $\beta\gamma$ from 40 to over 3000 with electrons. The measurements were made by counting drops along the tracks formed in a cloud chamber to determine the ionization, and by measuring the radius of curvature in a magnetic field to determine the momentum. The identity of the π-mesons was established by a counter system requiring a traversal of about 4" of lead. Electron showers were obtained by another counter system and the electron identities were inferred from the appearance of the showers in the cloud chamber. The counter control system alternated to take two π-meson pictures followed by one electron shower and this cycle repeated continuously.

Laboratory for Nuclear Science, Mass. Inst. of Tech., Cambridge.
QUARTERLY PROGRESS REPORT [NO. 4] ON CONTRACT N5ori-078(06), by J. R. Zacharias, E. R. Gilliland and others. 31 Mar 47, 41p.
Order from LC mi$3.30, ph$7.80 PB 139 745

This report includes progress in the fields of: (1) High energy particle physics; (2) Nuclear processes in the region of the binding energy of the nucleus; (3) Nuclear chemistry; (4) Nuclear applications to medical research.

Washington U., St. Louis, Mo.
FINAL STATUS REPORT ON CONTRACT AF 18(600)777, by Franklin B. Shull. 19 Nov 57, 11p. AFOSR TR-58-74; AD-158 328.
Order from LC mi$2.40, ph$3.30 PB 135 132

This program was a study of "stripping" reactions. Experimental results are summarized for the following reactions: $Na^{23}(d,p)Na^{24}$; $Ti^{47}(d,p)Ti^{48}$; $Ti^{48}(d,p)Ti^{49}$; $Fe^{56}(d,p)Fe^{57}$; $Fe^{57}(d,p)Fe^{58}$; $Ni^{60}(d,p)Ni^{61}$; $Ni^{61}(d,p)Ni^{62}$; $Zn^{64}(d,p)Zn^{65}$; $Zn^{66}(d,p)Zn^{67}$; $Zn^{67}(d,p)Zn^{68}$; $Zn^{68}(d,p)Zn^{69}$

Nuclear Structure

Aeronutronic Systems, Inc., Glendale, Calif.
CHARACTERIZATIONS OF HYDROGEN ATOM SYSTEMS, by J. T. Jones, Jr., M. H. Johnson and others. Rept. on Contract Nonr-2361(00). 30 June 58, 48p. 14 refs. Pub. no. U-216.
Order from LC mi$3.30, ph$7.80 PB 139 851

The recombination rate of atomic hydrogen at low temperatures in a strong magnetic field is greatly inhibited by the electrostatic exchange force between hydrogen atoms with parallel spin. It appears that long term stability can only be achieved by a magnetic field sufficiently strong to saturate the nuclear spins as well as the electron spins.

Air Force Cambridge Research Center, Bedford, Mass.
ABSORPTION ANALYSIS OF X-RAY SPECTRA PRODUCED BY BERYLLIUM-WINDOW TUBES OPERATED AT 20 TO 50 KVP, by Edward A. Burke and Ralph M. Pettit. Dec 58, 58p. 19 refs. AFCRC-TR-58-362; AD-208 042.
Order from LC mi$3.60, ph$9.30 PB 139 972

Spectra produced by chromium, copper, molybdenum, and tungsten-target beryllium-window X-ray tubes operated in the 20- to 50-kvp region have been determined by analyzing absorption data. It was ascertained that a simple function, containing only two empirically determined constants, could be used to represent the continuous spectra produced by all of the tubes at all voltages studied. One of the constants was found to be independent of tube target material and applied voltage; the other, a simple linear function of voltage.

California U., Los Angeles.
CONNECTION BETWEEN THE SHELL MODEL AND THE ROTATIONAL MODEL, by S. A. Moszkowski. Technical rept. no. 1 on Contract DA 04-495-ORD-913. July 58, 20p. 12 refs.
Order from LC mi$2.40, ph$3.30 PB 136 591

Some simple systems of interacting particles exhibiting collective behavior and rotational spectra are mentioned. Two examples are discussed in some detail: (1) Particles in the lp shell interacting via spin-independent central interactions (L-S coupling). (2) The coupling scheme of Elliott involving transformations properties of the wavefunctions under U_3, the group of unitary transformations in three dimensions.

Radioactivity

Michigan State U., East Lansing.
USE OF A SAMARIUM LOADED LIQUID SCINTILLATOR FOR THE DETERMINATION OF THE HALFLIFE OF Sm^{147}, by G. B. Beard and W. H. Kelly. Rept. on Contract AF 49(638)10. 18 June 58, 8p. 2 refs. AFOSR TN-58-497; AD-158 307.
Order from LC mi$1.80, ph$1.80 PB 135 616

An investigation of the use of metal loaded organic liquid scintillators for the study of long lived alpha emitters has been carried out. The method was checked using a samarium loaded scintillator. A specific activity corresponding to a halflife of $(1.28 \pm 0.04) \times 10^{11}$ years for the alpha decay of Sm^{147} was found. This is in agreement with the published halflife measured using a different technique.

Naval Radiological Defense Lab., San Francisco, Calif.
CASCADE FILTRATION THEORY: A BASIS FOR STUDYING SUSPENDED PARTICLES, by J. M. Campbell. 19 Aug 55, 11p. 1 ref. Research and Development Technical rept. USNRDL-TR-61; AFSWP-905.
Order from LC mi$2.40, ph$3.30 PB 140 277

A method is suggested for measuring the radioactivity of fall-out particles in atomic clouds as a function of their size. This method consists of drawing the particles through a bank of filters in series and measuring the radioactivity retained on each filter. Reduction of these data to the desired distribution function is indicated by a matrix equation.

PERSONNEL SUPPLIES AND PERSONAL EQUIPMENT

Adjutant General's Office, Washington, D. C.
STANDARDIZATION OF COMMON CORE TESTS, by James B. Trump, Richard K. White and others. Dec 57, 23p. 4 refs. PRB Technical research rept. 1109.
Order from LC mi$2.70, ph$4.80 PB 135 122

Standardization of five new classification tests, constructed jointly by Army, Navy, and Air Force research scientists, was required to furnish information concerning the meaning and proper interpretation of scores on the new tests. The tests, reflecting the common thread of personnel requirements across the services, had been previously constructed to effect improvement and economies in classification test construction for all the services. For the Army there was the additional need to determine the suitability of the new tests for incorporation within the Army Classification Battery. To furnish necessary research data, Army, Navy, and Air Force experimentally tested a total of 3000 newly inducted men with the five common core tests. Navy and Air Force submitted their scores to Army which constructed tables with which to convert raw test scores to the standard score system of each service in time of full mobilization. Army, for its own information, analyzed these scores to see how the new tests would fit into the Army Classification Battery. The other services did likewise for their own purposes. Appropriate conversion tables were constructed and furnished each service. Army found that Common Core Verbal and Arithmetic Reasoning Tests could improve upon the Reading and Vocabulary and Arithmetic Reasoning Tests of the ACB from the general aspects of administrative feasibility and superior measurement of the desired abilities. Steps were taken to introduce these tests into the ACB and to revise or conduct further research with respect to the other three.

Air Proving Ground Center, Elgin AFB, Fla.
PERSONAL PROTECTIVE EQUIPMENT FOR MISSILE ROCKET FUEL HANDLERS, by Fredric Raichlen. Mar 59, 22p. APGC TN-59-8; AD-201 620.
Order from LC mi$2.70, ph$4.80 PB 139 938

Available suits in general provide sufficient if not excessive protection to the wearer against toxic chemicals such as those used in the RASCAL and the BOMARC missiles; features in a full-protection garment for this type of work are recommended. Three different types of clothing sets, each designed to provide adequate protection and maximum comfort for a specific type of operation, are recommended.

Norte Dame U., Ind.
FINAL REPORT OF RESEARCH. Rept. for 1 Jan 52-31 Mar 54, by P. C. Trexler. Apr 54, 26p.
Order from LC mi$2.70, ph$4.80 PB 135 912

(1) Four protective garments suitable for germicidal bath decontamination have been supplied together with accessory equipment. (2) A protective garment to be

decontaminated by a germicidal shower and completely sealed has been developed and used satisfactorily for a year. (3) A protective garment that can be decontaminated by germicidal sprays and is easier to use than the above garment has been developed. (4) The limitations have been determined for a garment having a self contained air supply and using ice as a coolant.

Quartermaster Research and Engineering Center, Natick, Mass.
HOT WEATHER BODY ARMOR: AN ANALYSIS OF REQUIREMENTS AND FEASIBILITY, by W. J. G Goddard, J. H. Vanderbie, and A. Lastnik. June 58, 15p. 7 refs. Clothing Branch Series rept. no. 5.
Order from LC mi$2.40, ph$3.30 PB 135 611

The standard armor vest can be worn for at least one (1) hour during moderately severe activity or for at least two (2) hours during moderate activity under stressful hot environment conditions provided no combat weights are carried and the subjects are physically well conditioned and heat acclimatized. Reduced body area coverage in designs that do not provide for ventilation, allows a small amount of relief from heat stress.

Quartermaster Research and [Engineering] Center, Natick, Mass.
IMPROVEMENT OF THE PROTECTIVE PROPERTIES OF NYLON ARMOR FABRICS THROUGH FINISHING TREATMENTS, by W. James Lyons, Constantin J. Monego and others. May 56 [57]p. Textile Series rept. no. 91.
Order from LC mi$3.60, ph$9.30 PB 135 078

A variety of conventional and special finishing treatments given a number of nylon armor fabrics of the basketweave construction are described. In addition to the standard yarn and fabric tests, and the ballistic acceptance test, tests of the following special properties were used in the evaluations of the finished fabrics: (a) bursting strength, (b) yarn pull-out force, (c) fabric stiffness, and (d) air permeability.

PHYSICS

Air Force Cambridge Research Center, Bedford, Mass.
CALORIMETRIC LOSS MEASUREMENTS ON FERROMAGNETIC CORES, by E. R. Czerlinsky and R. A. MacMillan. Mar 57, 41p. AFCRC TR-57-107; AD-117 085.
Order from LC mi$3.30, ph$7.80 PB 128 571

This calorimeter and the techniques of operation have been developed for the purpose of evaluating ferromagnetic materials in the form of transformer cores by measuring heat quantities generated as core loss. Reference to the detailed caloric data of the masses involved is avoided by special conditions of operation employing a calibration heater and cooling system as follows: (1) By means of a cold gas cooling system, the contents of the calorimeter are cooled below room temperature, whereupon heat is supplied at a constant rate from the heater or source to be measured, until a discrete temperature above room temperature is obtained or exceeded. (2) At the instant the temperatures inside and outside the vessel are equal, no heat exchange can occur, and the rate of change of temperature is an exact measure of the rate of heat supplied. However, it is not feasible to read this value from the recording with adequate accuracy; therefore a practical method of evaluation has been conceived. Mathematical analysis of the problem is discussed, together with the construction and operation of such a device. A special circuit and apparatus for automatically obtaining the correct evaluation electronically are revealed in the appendices.

Acoustics

Acoustics Lab., Mass. Inst. of Tech., Cambridge.
RESEARCH IN THE FIELD OF ACOUSTICAL INSTRUMENTATION, by Jordan J. Baruch. Final rept. on Contract N5ori-078(69). 2 June 58, 21p. 1 ref. DSR no. 6961.
Order from LC mi$2.70, ph$4.80 PB 139 844

California U., Los Angeles.
EFFECT OF VISCOSITY ON RAYLEIGH WAVES, by Paul Queney. Scientific rept. no. 2 on Dynamics of Simple Atmosphere Flow, Contract AF [19] (604)1377. Mar 58, 21p. AFCRC TN-58-427; AD-152 597.
Order from LC mi$2.70, ph$4.80 PB 135 253

This theoretical study was suggested by some recent experimental results concerning the formation of small sand ripples or larger sand waves in natural wind or in air tunnels.

Naval Research Lab., Washington, D. C.
ON THE THEORY OF FLEXURAL PIEZOCERAMIC CIRCULAR PLATE SOUND RADIATORS, by S. Hanish. Interim rept. 26 Feb 59, 28p. 8 refs. NRL rept. 5259.
Order from LC mi$2.70, ph$4.80 PB 137 631

Circular electrostrictive plates, oppositely polarized and cemented together to form bilamellate disks, are submerged in a semi-infinite medium and driven by an applied electric field, or by applied acoustic pressures, to radiate sound. Formulas for plate velocity, acoustic power radiated, acoustic pressure, mechanical Q, etc., have been derived for the cases of centrally supported and edge supported disks in infinite baffles.

Naval Research Lab., Washington, D. C.
THEORY OF A VERY THIN PIEZOCERAMIC HOLLOW SPHERE UNDERWATER SOUND RADIATOR, by S. Hanish. Interim rept. 6 Mar 59, 37p. 13 refs. NRL rept. 5267.
Order from LC mi$3.00, ph$6.30 PB 136 814

The theory of the thin shell hollow sphere piezoceramic underwater sound radiator is investigated in detail. Starting with the equations of state an equation of motion is derived for the case of pure radial motion. Formulas are deduced for coefficient of electromechanical coupling, velocity, power conversion, mechanical Q, transmitting pressure, impedance, receiving response, and efficiency. Design charts based on the properties of two popular ceramics (a $BaTiO_3$-$CaTiO_1$ mix and a $PbTiO_3$-$PbZrO_3$ mix) are also presented. The limits of validity of the derived equation are also discussed.

Naval Training Device Center, Port Washington, N. Y.
ANNOTATED BIBLIOGRAPHY OF VOICE COMUNICATIONS RESEARCH COMPLETED UNDER CONTRACT N6ori-105, TASK ORDER II. 4 June 58, 51 refs. Technical rept. NAVTRADEVCEN 104-2-52.
Order from LC mi$3.00, ph$6.30 PB 139 856

An attempt has been made to abstract and classify reports so that research workers can easily locate related reports and obtain an over-all view of their contents. For this purpose, the abstracts have been divided into the major categories outlined in the Table of Contents. Within these categories, the abstracts are in alphabetical order according to author.

Ohio State U. Research Foundation, Columbus.
NUMBER-TELLING METHODS, by Henry M. Moser, John J. O'Neill, and Sol Adler. Technical rept. no. 48 on Contract AF 19(604)1577. July 58, 23p. 12 refs. AFCRC TR-58-55; AD-152 647.
Order from LC mi$2.70, ph$4.80 PB 136 574

Methods of telling one-, two-, three-, and four-digit numbers were tested with American and foreign speakers, and American listeners. Speakers were equally distributed among male and female representatives of the major American dialects, and foreign nationals of English, French and Spanish origin.

Psychological Lab., Mass. Inst. of Tech., Cambridge.
STUDIES IN AURAL PRESENTATION OF INFORMATION, by J. C. R. Licklider. Final rept. on Contract AF 18(600)1219. 31 Oct 57, 48p. 23 refs. AFCRC-TR-58-53; AD-152 564; In cooperation with Research Lab. of Electronics.
Order from LC mi$3.30, ph$7.80 PB 135 383

This report summarizes the results of research conducted. The topics investigated were the following: (1) pitch perception, (2) auditory signal detection, (3) auditory signal identification, (4) the masking of speech by certain special types of interference, and (5) the development of a combined aural-visual radar simulator.

Royal Inst. of Tech. (Sweden).
MODERN INSTRUMENTS AND METHODS FOR ACOUSTIC STUDIES OF SPEECH, by G. Fant. Technical note no. 1 on Contract AF 61(514)1084. June 57, 78p. 110 refs. Speech Transmission Lab. rept. no. 8; AFCRC TN-58-112; AD-146 813.
Order from LC mi$4.50, ph$12.30 PB 135 042

This report, summarizes some of the more important techniques of studying speech by means of acoustic analysis and synthesis. Special emphasis has been laid on recent developments at the Royal Institute of Technology, Stockholm, Sweden. The basic relations between articulation and speech wave enabling a physiological interpretation of spectrograms are discussed. Methods of spectrographic and oscillographic analysis and classification of the essential signal structure of vowels and consonants are exemplified. Acoustic correlates to stress, juncture, and word accent are described and discussed.

School of Aviation Medicine, Randolph [AFB] Tex.
SOME IMPLICATIONS OF DECIBEL SCALE, by Juergen Tonndorf. Special rept. Feb 53, 9p. 3 refs.
Order from LC mi$1.80, ph$1.80 PB 135 474

Limitations of human hearing are discussed in terms of the decibel scale; steady pressure equivalents and corresponding ranges of weight and length are given in units of everyday use. The total sound power developed by a jet airplane is approximated and related to power consumption and thrust.

Electricity and Magnetism

Diamond Ordnance Fuze Labs., Washington, D. C.
FERROMAGNETIC RESONANCE IN UNIAXIAL POLYCRYSTALLINE MATERIALS, by N. Karayianis and C. Morrison. 15 Sep 58, 19p. 5 refs. TR-644.
Order from LC mi$2.40, ph$3.30 PB 137 411

Theoretical effects of anisotropy on the line-width of a polycrystalline material. A finite intrinsic line-width is assumed for the single crystal, and effects of grain boundaries, impurities, inhomogeneities, and volume and surface divergence of the magnetization are ignored.

Indiana Steel Products Co., Valparaiso.
LONG TERM MAGNETIC STABILITY OF ALNICO V AND OTHER PERMANENT MAGNET MATERIALS, by K. J. Kronenberg and M. A. Bohlmann. Rept. on Contract AF 33(616)3385. Dec 58, 74p. 19 refs. WADC Technical rept. 58-535; AD-203 387.
Order from OTS $2.00 PB 151 716

The long term stability of permanent magnets lying quietly at room temperature was investigated. For most applications (where tolerances are 3% or even more), magnets of Alnico and Indox are considered stable. The following generalizations for magnets at room temperature were made from the results: (1) the higher the coercive force, the more stable is remanence; (2) the larger the shape ratio L/D of a magnet, the more stable is remanence; (3) when remanence becomes less in time, the decrease is linear on a logarithmic time scale; (4) remanence is completely stabilized by reducing it 5-15%, while more

or less knockdown can result in erratic behavior; and (5) incompletely magnetized samples are more stable than magnets fully magnetized but not as stable as those properly stabilized.

Westinghouse Electric Corp., East Pittsburgh, Pa.
IMPROVED TORQUE MAGNETOMETER, by W. S. Byrnes and R. G. Crawford. Rept. on Solid State Research and Properties of Matter, Contract AF 33(616)309. Sep 58, 33p. 11 refs. WADC Technical note 58-307; AD-204 219.
Order from OTS $1.00 PB 151 721

This report is a complete description of an automatic recording torque magnetometer. The instrument is used to determine the anisotropy constants of anisotropic ferromagnetic materials. Included in the report is an Appendix briefly describing the theory and technique of torque measurements as applied to magnetic materials. A complete measurement is given for a specific sample of 3.06 percent silicon iron.

Electronics

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
ANALYSIS AND RE-EVALUATION OF THE ROLE OF HORIZONTAL DRIFT IN PRODUCING FADING IN TROPOSPHERIC SCATTER PROPAGATION, by Thomas Laaspere. Scientific rept. no. 1 on Contract AF 19(604)3494. 31 Aug 58, 101p. 20 refs. Research Rept. EE 380; AFCRC-TN-58-373; AD-160 822.
Order from LC mi$5.70, ph$16.80 PB 136 576

Fading of the received signal in tropospheric scatter propagation is caused mainly by the turbulent motions of the atmosphere. A detailed analysis shows that the component of horizontal drift perpendicular to the path of transmission is considerably more effective in giving rise to a spread in the spectrum of the received frequencies than has been realized previously. The conclusion is drawn that on tropospheric transhorizon paths much of the signal fading must be caused by the component of the horizontal drift of the atmosphere perpendicular to the path.

Electronics Research Labs., Columbia U., New York.
SYNTHESIS OF OPTIMUM RANDOM SAMPLING SYSTEMS, by Arthur R. Bergen. Technical rept. T-7/133 on Contract AF 19(604)1572. Apr 57, 101p. 24 refs. CU-13-58-AF-1572-EE; AFCRC-TN-58-146; AD-152 375.
Order from LC mi$5.70, ph$16.80 PB 135 208

This work extends the Wiener theory of linear least squares smoothing and prediction to the case of a randomly sampled signal time series. Attention is primarily directed to two problems: (1) the synthesis of an optimum linear filter for specified sampling statistics, (2) the determination of a necessary condition for optimum random sampling.

Harvard Coll. Observatory [Cambridge, Mass.]
ANGULAR DISTRIBUTION AND BEAM GEOMETRY, by D. H. Tomboulian and D. E. Bedo. Scientific rept. no. 6 on Utilization of the Orbital Radiation from the Cambridge Electron Accelerator, Contract AF 19(122)482. July 58, 13p. AFCRC TN-58-459; AD-152 642.
Order from LC mi$2.40, ph$3.30 PB 135 876

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
VECTOR FORMULATIONS FOR THE ELECTROMAGNETIC FIELD EQUATIONS IN UNIFORM WAVEGUIDES CONTAINING ANISOTROPIC MEDIA, by A. D. Bresler. Rept. on Contract AF 19(604)2031. 3 Sep 58, 24p. 11 refs. Research rept. R-676-58; PIB-604; AFCRC-TN-58-571; AD-160 885.
Order from LC mi$2.70, ph$4.80 PB 139 421

A variety of vector formulations for the electromagnetic field equations are deduced which are applicable to uniform waveguides containing anisotropic media restricted only by the requirement that the permeability and permittivity dyadics be independent of the axial coordinate. Among the results obtained are vector formulations for (a) the homogeneous transverse vector field equations (transverse vector eigenvalue problem), (b) the associated equations determining the longitudinal field components (associated scalar eigenvalue problem), and (c) the equations expressing the relationships between the logitudinal and transverse field components. It is then shown that these vector formulations reduce to those known to be applicable to uniform waveguides containing homogeneous axially magnetized gyrotropic media.

Tennessee U. Engineering Experiment Station, Knoxville.
USE OF TERMINATED MONOPOLES IN ANTENNA ARRAYS, by W. T. Patton and J. D. Tillman. Scientific rept. no. 1 on Synthesis of Prescribed Antenna Patterns, Contract AF 19(604) 1557. May 58, 45p. 4 refs. AFCRC-TN-58-147; AD-152 378.
Order from LC mi$3.30, ph$7.80 PB 135 207

This report contains a theoretical analysis of the terminated monopole antenna, and gives experimental verification of the pertinent properties of the antenna. A terminated monopole is basically a folded monopole in which a terminating impedance is inserted between the return lead and ground. Data are presented on the radiation pattern, the isolated impedance, and mutual impedance for such antennas. It is shown that mutual coupling effects in multi-element arrays can be reduced at the expense of efficiency.

Molecular Physics and Spectroscopy

Centro di Studio Per La Fisica Delle Microonde (Italy).
FUNDAMENTAL RESEARCH ON ELECTROMAGNETIC THEORY AND MICROWAVE SPECTROSCOPY. Technical rept. on Contract AF 61(514)903.

Dec 57, 13p. AFCRC TR-58-137; AD-152 390.
Order from LC mi$2.40, ph$3.30 PB 135 231

This report is concerned with mechanical actions of electromagnetic waves and applications of differential geometry to microwave optics.

Field Emission Lab., Pennsylvania State U., University Park.
STUDY OF METAL SURFACES BY THE FIELD EMISSION MICROSCOPE. STUDY OF PHTHALOCYANINE AND SOME OTHER PLANAR MOLECULES IN THE FIELD EMMISSION MICROSCOPE, by Allan J. Melmed. Technical rept. on Contract AF 18(600)672. July 58, 74p. 24 refs. AFOSR TN-58-646; AD-162 178.
Order from LC mi$4.50, ph$12.30 PB 136 386

An improved technique for studying organic substances in the field emission microscope is described, in which the field emitter is kept at a low temperature during observations. Field emission patterns of organic molecules such as phthalocyanine or flavanthrene show improved stability when the tip temperature is lowered. Field desorption and hydrogen ion images of Cu-phthalocyanine on tungsten and platinum are investigated. Finally, a mechanism for molecular image formation is proposed.

Institute for Molecular Physics, U. of Maryland, College Park.
ELASTIC SCATTERING OF SLOW IONS IN GASES, by Edward A. Mason and Joseph T. Vanderslice. Rept. on Contract AF 18(600)1562. 24 Feb 59, 31p. 18 refs. IMP-OSR-12; AFOSR [TN]-59-185; AD-211 325.
Order from LC mi$3.00, ph$6.30 PB 139 853

Differential cross sections for the elastic scattering of slow ions by neutral atoms or molecules have been calculated by numerical integration of the classical equations of motion. The model used for the ion-neutral potential energy function consists of three terms: an r^{-4} attraction, an r^{-6} attraction, and an r^{-12} repulsion. The attractive terms are theoretically sound, but the repulsive term is empirical. Quantum effects have been ignored, but an approximate formula indicates at what point the classical calculations begin to fail in any particular case. The results should be of most use in the very low energy region where experimentation is difficult.

Ohio State U. Research Foundation, Columbus.
USE OF BERYL CRYSTALS FOR LONG-WAVELENGTH X-RAY SPECTROSCOPY, by J. Korringa, E. L. Jossem and others. Technical rept. no. 7 on Contract N6onr-225(21). June 57, 35p. 26 refs.
Order from LC mi$3.00, ph$6.30 PB 135 359

Beryl crystals used in the two-crystal spectrometer had changed during the past five years resulting in a decrease in their percent reflection. This change, when combined with the increase in the width, reflects similar changes in the spectral window of the spectrometer and a corresponding decrease in resolving power.

Palmer Physical Lab., Princeton U., N. J.
THE MODULATION-GRID METHOD FOR ELIMINATING DOPPLER BROADENING OF MICROWAVE SPECTROSCOPIC LINES, by G. S. Newell. Final rept. for 1 Apr 51-31 Mar 52 on Contract DA 36-039-sc-5541. [1952] 184p. 18 refs.
Order from LC mi$8.40, ph$28.80 PB 140 065

This report considers a method for eliminating the Doppler effect as a source of line breadth. A line width 1/10th of the best previous line has been obtained. To make measurements on such a narrow line imposes serious limitations upon the frequency stability and sensitivity of the measuring equipment. The theory of the method is discussed completely and theoretical expressions for line shape and strength are obtained. The problem of stabilizing the klystron is considered in detail. Methods for producing a phase or frequency look of a klystron to a signal derived from a crystal-controlled oscillator are discussed. The problem of designing a signal detection system with adequate sensitivity is also discussed. The principle results obtained on the line widths of the 3-3 line of ammonia under a variety of conditions are summarized.

Princeton U., N. J.
DIELECTRIC INVESTIGATION OF POLAR MOLECULES IN LIQUIDS AND SOLIDS, by Charles P. Smyth. Final rept. for 1 Nov 54-31 Dec 58 on Contract AF 18(600)1331. 31 Dec 58, 12p. 20 refs. AFOSR-TR-59-22; AD-211 668.
Order from LC mi$2.40, ph$3.30 PB 139 904

Dielectric measurements at low and at microwave frequencies have been carried out and used to calculate critical wavelengths or relaxation times for s-trioxane, paraldehyde, diphenyl and benzyl phenyl ether, several liquid ketones, o- and p-bromobiphenyl in different solvents, p-nitrobiphenyl, 2-naphthylamine, phenyl isothiocyanate, several aromatic isocyanates and many substituted benzenes and pyridines. Dipole moments have been determined for styrene, toluene, ethylbenzene, cumene, dioxane, acepleiadylene, and three substituted disilanes.

Western Ontario U. (Canada).
INTENSITY MEASUREMENTS OF MOLECULAR SPECTRA. III. AN EXPERIMENTAL STUDY OF BAND INTENSITIES IN O_2^+, CO AND NO BAND SYSTEMS, by D. Robinson and R. W. Nicholls. Scientific rept. no. 3 on Contract AF 19(604)1718. 1 Feb 58, 29p. 18 refs. AFCRC TN-58-454; AD-152 636.
Order from LC mi$2.70, ph$4.80 PB 139 820

The measurement of the relative intensities of band systems in the spectra of the aurorae and airglow is of great importance in the study of the processes which occur in the upper atmosphere. From laboratory intensity measurements, transition probabilities can be determined and applied to interpret the atmospheric intensities in terms of the excitation conditions. Consequently, photographic and photoelectric techniques have been applied to obtain the relative intensities of the following five band systems of astrophysical interest: O_2^+ Second Negative, CO Angstrom, CO Third Positive, NO Gamma, NO Beta. The results have been

used to determine the form of the electronic transition moment $R_e(r)$ and the relative transition probabilities $p_{v'v''}$ for the appropriate systems, using theoretically calculated Franck-Condon factors $q_{v'v''}$ and r-centroids $\bar{r}_{v'v''}$.

Western Ontario U. (Canada).
INTENSITY MEASUREMENTS OF MOLECULAR SPECTRA. IV. INTENSITY MEASUREMENTS ON OVERLAPPED MOLECULAR BANDS, by D. Robinson and R. W. Nicholls. Scientific rept. no. 5 on Contract AF 19(604)1718. 1 May 58, 37p. 16 refs. AFCRC TN-58-456; AD-152 638.
Order from LC mi$3.00, ph$6.30 PB 139 819

The measurement of intensities of molecular band systems is often complicated by the partial overlapping of adjacent bands, making the direct measurement of integrated total band intensities extremely difficult, if not impossible. Several attempts have been made by various authors to overcome the problem, none being generally applicable. Two general methods are suggested here. In the first a known fraction of the band is employed, and in the second the rotational intensity distribution within a band is interpreted in terms of the total band intensity. The methods have been tested experimentally and found to be in good agreement for the NO β and O_2^+ Second Negative Systems where the integrated intensities were independently measured. (See also PB 139 820)

Western Ontario U. (Canada).
STUDIES OF ATOMIC COLLISIONS. I. A NUMERICAL METHOD OF SOLUTION OF SOME EQUATIONS OF SCATTERING, by P. A. Fraser. Scientific rept. no. 4 on Contract AF 19(604)1718. 30 Apr 58, 42p. 9 refs. AFCRC TN-58-455; AD-152 637.
Order from LC mi$3.30, ph$7.80 PB 139 864

A numerical method of solving approximately differential and integro-differential equations, and coupled systems of such equations, which arise in scattering problems, is described mainly by means of examples. The method consists essentially of replacing the differential or integro-differential equations by integral equations, which imply satisfaction of the boundary conditions; then the integrals in the integral equations are approximated by some numerical approximation.

Western Ontario U. (Canada).
TRANSITION PROBABILITIES OF MOLECULAR BAND SYSTEMS. XV. THE INFLUENCE OF THE VIBRATION-ROTATION INTERACTION ON THE INTENSITIES OF DIATOMIC MOLECULAR LINES AND BANDS, by P. A. Fraser. Scientific rept. no. 6 on Contract AF 19(604)1718. 15 Aug 58, 48p. 20 refs. AFCRC TN-58-659.
Order from LC mi$ 3.30, ph$7.80 PB 139 865

The effect of the vibration-rotation interaction on the theoretical intensities of diatomic electronic bands is calculated on the basis of the Morse-Pekeris oscillator. The results for bands of 3 systems, show that the effect is usually quite small but there are cases and circumstances where the effect may have to be taken into account.

Optics

Army Medical Research Lab., Fort Knox, Kr.
BINOCULAR SUMMATION OF GEOMETRICAL PATTERNS AS A RANGE INDICATOR, by George S. Harker and Robert A. Wickersham. Oct 52, 21p. 11 refs. Rept. no. 96.
Order from LC mi$2.70, ph$4.80 PB 135 162

Avco Research Lab., Everett, Mass.
EMISSIVITY OF HIGH TEMPERATURE AIR, by James Keck, Bennet Kivel, and Tunis Wentink, Jr. Rept. on Contract AF 04(645)18. Apr 57, 18p. 12 refs. Research rept. 8 (formerly Research note 33) AD-150 789.
Order from LC mi$2.40, ph$3.30 PB 139 934

Studies indicated that NO appears to contribute considerably less to the radiation from high-temperature air. Equations are given which relate the measured emissitivity to the absorption coefficient. Experiments are described in which dry air that was heated by a shock wave reflected from the end of a closed shock tube was used as the source of radiation. The data which were obtained included time resolved spectrograms and absolute intensity measurements made with a calibrated monochromator and photocells. The wavelength region that was investigated extended from about 2500 to 9000 A. The over-all results were that at 8000°K between 2500 and 8800 A, N and CN were the major species detected. Spectra and corresponding densitometer curves were obtained for air at wavelengths below 4000 A. In this region, the NOβ-band system was expected to have appreciable intensity, but no positive identification was made of any NO bands in the spectra. A discussion of the theoretical studies includes the CN violet band system, the N second positive band system, the O bound-free and free-free radiators.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
SPECTRAL EFFECTS IN INTERFEROMETRY, by G. D. Kahl and D. B. Sleator. Nov 57, 20p. 8 refs. Rept. no. 1040.
Order from LC mi$2.40, ph$3.30 PB 135 527

The influence on the fringe intensities of small sources with known spectral energy density functions is analyzed both theoretically and experimentally for double beam interferometers of the Mach-Zehnder type. Simple relations between the spectrum and the intensity and extent of the fringe field are presented. Special attention is given energy sources consisting of a primary source used with a monochromator. Experimental confirmation is demonstrated.

Bureau of Ordnance, Navy Dept., Washington, D. C.
COMPARISON OF SKY INFRARED INTENSITIES IN FOUR SELECTED WAVELENGTH BANDS. Rept. 3 on Infrared Sky Radiation. 5 Apr 57, 58p. 7 refs. NAVORD rept. 4870.
Order from LC mi$3.60, ph$9.30 PB 140 263

Eaton Electronics Research Lab., McGill U. (Canada).
PHASE DISTRIBUTION IN THE IMAGE SPACE OF A MICROWAVE LENS SYSTEM, by G. W. Farnell. Rept. for 1 Mar 57-31 Oct 58 on Contract AF AF 19(604)2228. Oct 58, 89p. 2 refs. E.E.R.L. Technical rept. no. 39; AFCRC-TR-58-197; AD-206 580.
Order from LC mi$4.80, ph$13.80 PB 139 912

During this period the phase structure of the diffraction image produced by a microwave lens has been investigated theoretically and experimentally. In this report, calculated contours of constant phase and of constant intensity are presented in normalized coordinates independent of system geometry.

Electrical Engineering Research Lab., U. of Illinois, Urbana.
DEVELOPMENT OF INFRARED SOURCES, by Walter Welkowitz and H. P. Messinger. Final rept. on Contract W33-038-ac-21811. 1 Dec 50, 147p. 45 refs. ATI-97 601.
Order from LC mi$7.20, ph$22.80 PB 140 176

The purpose of this project was to investigate new methods of infrared generation. A major portion of the work consisted of a complete theoretical analysis of an electronic system involving a bunched electron beam used to excite metal cavity couplers. The overall infrared generation system involved a new type of amplifier which was considered applicable in the centimeter and millimeter wavelength ranges. Calculations for this amplifier at 1.5 cm. were carried out and a power gain of about 25 db. was found to be practical. In an attempt to use crystals as coupling units, some experiments were carried out on crystal excitation with electron beams.

Electrical Engineering Research Lab., U. of Illinois, Urbana.
INFRARED SOURCES, by William J. Fry. Interim rept. 1, 18 June 48-18 Feb 49, on Contract W33-038-ac-21811. 18 Mar 49, 19p. 2 refs. ATI-53 772.
Order from LC mi$2.40, ph$3.30 PB 140 172

An interim progress report is submitted on the investigation of infrared light sources. The source considered is a pulsed beam of electrons and the associated planar filament and multiple grid slit system for collimation and production of a set of plane sheets of current. Facilities for construction, evacuation, and operation of the tube have been set up and elements of the tube are being assembled.

Electrical Engineering Research Lab., U. of Illinois, Urbana.
INFRARED SOURCES, by William J. Fry, H. L. Van Velzer and others. Progress rept. for 24 Nov 49-1 Feb 50 on Contract W33-038-ac-21811. 1 May 50, 64p. 6 refs.
Order from LC mi$3.90, ph$10.80 PB 140 175

A new type of electronic infrared source is being developed. The discussion in this report is a theoretical analysis of the complete problem and is intended to demonstrate, in principle, the rationality of the method.

Florida State U., Tallahassee.
PRECISION STUDIES OF X-RAY ATTENUATION COEFFICIENTS. I: Design of the experiment, by Richard D. Deslattes. Technical rept. no. 7 on Contract AF 18(603)64. 1958, 18p. AFOSR TN-57-425; AD-136 414.
Order from LC mi$2.40, ph$3.30 PB 135 151

The meaning of an X-ray attenuation coefficient is considered from the point of view of an experimental determination of its value. Thereafter, consideration is given to the factors which affect the precision of its measurement including those arising from the absorbers, those arising from the X-ray spectrometer's resolution in energy, and finally, those arising from the detection of the X-ray beam.

Naval Research Lab., Washington, D. C.
INFRARED DISPERSION AND THE DETERMINATION OF ABSORPTION COEFFICIENTS, by R. E. Kagarise. 23 Mar 59, 23p. 11 refs. NRL rept. 5277.
Order from OTS $0.75 PB 151 443

The refractive indices of liquid carbon tetrachloride, tetrachloroethylene, methylene iodide, and acetone have been measured using the interferometric method. In the case of the latter three compounds, the orders of interference were established by studying the materials dissolved in CS_2. By gradually increasing the concentration of solute it was possible to extrapolate the known orders of interference in CS_2 to the pure solute. The dispersion in the neighborhood of the 13μ absorption band of CCl_4 and the 9μ band of CH_2I_2 has been analyzed in terms of classical dispersion theory. The so-called oscillator strengths obtained from such analyses were found to be in good agreement with those obtained directly from integrated absorption coefficients. Finally, it has been shown that the two classical dispersion equations can be used to predict the ratio of the integrated absorption coefficients for the liquid and vapor states. The expression thus obtained is identical to that obtained by Polo and Wilson using a different approach.

Physical Research Labs., Clark U., Worcester, Mass.
ON THE SYMMETRICAL DOUBLET ANTENNA OF HIGH REFRACTIVE INDEX, by R. C. Gunter, Jr. Final rept. on Contract AF 19(604)2412. 3 Dec 58, 41p. 6 refs. AFCRC-TR-58-351; AD-160 759.
Order from LC mi$3.30, ph$7.80 PB 140 160

The general purpose of this contract was a study of the problems involved in using materials of high index of refraction in the design of microwave lenses and microwave systems. As a start in this direction, a high index of refraction doublet originally designed by Gunter was chosen. This system was originally designed simply to determine the extent to which the aberrations could be controlled by using materials of much higher indices of refraction than are available to optical designers. It was understood during the original design that the very high surface reflections might well cause trouble should this system ever be built without regard for these reflections.

Pomona Coll., Claremont, Calif.
ULTRASOFT X-RAY PHYSICS AND APPLICATIONS, by Burton L. Henke. Summary technical rept. on Contract AF 18(600)1045. June 57, 88p. 24 refs. AFOSR TN-57-436; AD-136 426.
Order from OTS $2.25 PB 151 182

Contents:
Ultrasoft x-ray analysis of micron systems, by B. L. Henke
Submicroscopic structure determination by long wavelength x-ray diffraction, by B. L. Henke and J. W. M. DuMond
Tables for the computation of intensity distribution functions for isotropic, non-absorbing spheres, by J. C. Miller
Semiempirical determination of mass absorption coefficients for the 5 to 50 angstrom x-ray region, by B. L. Henke, R. White, and B. Lundberg
Monochromatic sources of ultrasoft x-radiation for quantitative microradiographic analysis, by B. L. Henke
Conditions for optimum visual and photometric "contrast" in microradiograms, by B. L. Henke, B. Lundberg, and A. Engstrom
Slide rule for radiographic analysis, by B. Lundberg and B. L. Henke

Solid State Physics

Armour Research Foundation, Chicago, Ill.
RESEARCH INVESTIGATION ON PURIFICATION OF MATERIALS FOR SYNTHEYIC CRYSTAL GROWTH, by E. J. Latos. Rept. no. 6 (Quarterly) for 1 May-1 Aug 51 on Contract DA 36-039-sc-5459. 15 Aug 51, 20p. 4 refs.
Order from LC mi$2.70, ph$4.80 PB 140 056

Emphasis has been placed on the purification of ortho arsenic acid for the growth of aluminum arsenate. Methods for the purification of arsenic oxide are based on crystallization, sublimation and oxidation of the arsenic trioxide to pentoxide with hydrogen peroxide. Purification of chrysene and phenanthrene is discussed with the selection of chromatographic adsorption as a recommended procedure

Armour Research Foundation, Chicago, Ill.
RESEARCH INVESTIGATION ON PURIFICATION OF MATERIALS FOR SYNTHETIC CRYSTAL GROWTH, by E. J. Latos. rept. no. 9 (Quarterly) for 1 Aug 6-1 Nov 51 on Contract DA 36-039-sc-5459. 15 Nov 51, 17p.
Order from LC mi$2.40, ph$3.30 PB 140 049

Equal emphasis has been given to the purification of the arsenic oxides for growth of aluminum arsenate and to the purification of chrysene for growth of chrysene crystals. Sublimation and subsequent oxidation of arsenic trioxide to arsenic pentoxide with hydrogen peroxide is the best procedure available for the purification of the arsenic oxides. Purification of chrysene is by chromatographic adsorption.

Battelle Memorial Inst., Columbus, Ohio.
HALL COEFFICIENT AND MAGNETORESISTANCE IN SEMICONDUCTING DIAMOND, by R. T. Bate and R. K. Willardson. Technical note no. 2 on Contract AF 49(638)222. 1 Mar 59. 15p. 10 refs. AFOSR-TN-58-916; AD-204 565.
Order from LC mi$2.40, ph$3.30 PB 139 918

The Hall coefficient increases with increasing field, the total variation being about 10 per cent. The transverse magnetoresistance is proportional to H^2 at low fields, but deviates from this behavior at fields above 4000 gauss.

Bell Telephone Labs., Inc., New York.
FUNDAMENTAL STUDIES OF THE PROPERTIES OF NATURAL AND SYNTHETIC QUARTZ CRYSTALS, by J. C. King. Interim rept. no. 1, 1 Feb-1 June 55 on Contract DA 36-039-sc-64586. 15 June 55, 25p. 15 refs. Rept. no. 27424.
Order from LC mi$2.70, ph$4.80 PB 139 741

A detailed description is given of the special sample holder and electrometer input circuit enclosure developed for making conductivity measurements. Plots for "steady-state" conductivity (along the optic axis) versus temperature are given for samples of clear natural and synthetic quartz. The resistivity of the synthetic material is two decades greater than that for natural quartz over most of the temperature range.

Bell Telephone Labs., Inc., New York.
FUNDAMENTAL STUDIES OF THE PROPERTIES OF NATURAL AND SYNTHETIC QUARTZ CRYSTALS, by J. C. King. Interim rept. no. 2, 1 June-31 Aug 55, on Contract DA 36-039-sc-64586. 15 Dec 55, 35p. 19 refs. Rept. no. 27424-A.
Order from LC mi$3.00, ph$6.30 PB 139 740

Temperature characteristic curves and Q values for AT-cut synthetic and natural quartz-crystal units have been measured. The Q of the synthetic samples varied between 54 and 83 per cent of that for natural quartz. Modifications of the apparatus used for the study of electrical conduction in quartz were made to provide for measurements above the transition temperature of quartz. Use of silver as the brazing solder makes it possible to operate the crystal holder up to 900°C. (See also PB 139 741)

Bell Telephone Labs., Inc., New York.
FUNDAMENTAL STUDIES OF THE PROPERTIES OF NATURAL AND SYNTHETIC QUARTZ CRYSTALS, by J. C. King. Interim rept. no. 3, 1 Sep-30 Nov 55, on Contract DA 36-039-sc-64586. 1 Apr 56, 21p. 4 refs. Rept. no. 27424-B.
Order from LC mi$2.70, ph$4.80 PB 139 742

A report is made of the dependence of frequency and resistance at series resonance upon temperature for a number of groups of synthetic quartz crystal units of the type 35AA. The quartz was synthesized under slightly different seed conditions. All synthetic units display a rather distinct resistance peak in the neighborhood of 70°C. (See also PB 139 740)

Bell Telephone Labs., Inc., New York.
FUNDAMENTAL STUDIES OF THE PROPERTIES OF NATURAL AND SYNTHETIC QUARTZ CRYSTALS, by J. C. King. Interim rept. no. 4, 1 Dec 55-29 Feb 56, on Contract DA 36-039-sc-64586. 25 June 56, 25p. 5 refs. Rept. no. 27424-C.
Order from LC mi$2.70, ph$4.80 PB 139 736

This report is devoted almost exclusively to an account of the Type 35 AA crystal unit used in the study of anelasticity of quartz. Details of the fabrication of the crystal unit are given, as well as electrical parameters and operating characteristics of general interest. Description of a precision variable oscillator and its utility, in association with a transmission circuit test set, for measuring the resistance of a crystal unit of this type operated at high overtones. (See also PB 139 742)

Bell Telephone Labs., Inc., New York
FUNDAMENTAL STUDIES OF THE PROPERTIES OF NATURAL AND SYNTHETIC QUARTZ CRYSTALS, by J. C. King. Interim rept. no. 5, 1 Mar-31 May 56, on Contract DA 36-039-sc-64586. 15 Sep 56, 33p. 6 refs. Rept. no. 27424-D.
Order from LC mi$3.00, ph$6.30 PB 139 737

The axial electrical conductivity of natural quartz and of synthetic quartz grown on a z-face seed plate has been measured as a function of temperature. The Q as well as the frequency-temperature characteristics of additional groups of synthetic quartz resonators have been determined over the temperature interval of -60° to 100°C.
(See also PB 139 736)

Bell Telephone Labs., Inc., New York.
FUNDAMENTAL STUDIES OF THE PROPERTIES OF NATURAL AND SYNTHETIC QUARTZ CRYSTALS, by J. C. King. Interim rept. no. 6, 1 June-31 Aug 56, on Contract DA 36-039-sc-64586. 21 Jan 57, 31p. 7 refs. Rept. no. 27424-E.
Order from LC mi$3.00, ph$6.30 PB 139 738

The anelasticity at a frequency of five megacycles of a sample of natural quartz and Y-bar seed-grown material have been determined from 1.2 to 100°K and are herein reported and compared.
(See also PB 139 737)

Bell Telephone Labs., Inc., New York.
FUNDAMENTAL STUDIES OF THE PROPERTIES OF NATURAL AND SYNTHETIC QUARTZ CRYSTALS, by J. C. King. Interim rept. no. 7, 1 Sep 56-30 Nov 56, on Contract DA 36-039-sc-64586. 25 Apr 57, 22p. Rept. no. 27424-F.
Order from LC mi$2.70, ph$4.80 PB 139 739

An examination of the Resonator behavior of various samples of synthetic quartz between -60° and 100°C has been completed. Only one crystal group out of three grown at reduced pressure proved to have a Q comparable to pilot plant z-face grown material.
(See also PB 139 738)

Bell Telephone Labs., Inc., New York.
FUNDAMENTAL STUDIES OF THE PROPERTIES OF NATURAL AND SYNTHETIC QUARTZ CRYSTALS, by J. C. King. Interim rept. no. 8, 1 Dec 56-28 Feb 57, on Contract DA 36-039-sc-64586. 15 July 57, 39p. 6 refs. Rept. no. 27424-G.
Order from LC mi$3.00, ph$6.30 PB 139 744

The anelastic behavior of synthetic quartz grown on different seed-plate orientations has been further examined between the temperatures 1.2° Kelvin with a transmission circuit test set at frequencies of 3 and 5 megacycles. The structural relaxation absorption which is a maximum at 50°K for a frequency of 5 megacycles is strongly dependent upon the crystallographic orientation of the seed plate on which the synthetic material is grown. (See also PB 139 739)

Bell Telephone Labs., Inc., New York
FUNDAMENTAL STUDIES OF THE PROPERTIES OF NATURAL AND SYNTHETIC QUARTZ CRYSTALS, by J. C. King. Interim rept. no. 10, 1 Dec 57-28 Feb 58, on Contract DA 36-039-sc-64586. 15 Mar 58, 50p. 10 refs. Rept. no. 27424-I.
Order from LC mi$3.30, ph$7.80 PB 139 743

Measurements are reported on the relaxation absorption found in natural smoky quartz (Brazilian). Available information pertaining to the 50°K acoustic absorption peak and the thermal conductivity in synthetic quartz is analyzed and discussed. (See also (PB 139 744)

California U., Los Angeles.
THE CRYSTAL STRUCTURE OF AMMONIUM CHLORITE AT -35 DEGREES C, by R. B. Gillespie and K. N. Trueblood. Technical note 5 on Perchlorates, Contract AF 18(600)857. Dec 58, 38p. 35 refs. AFOSR TN-59-103; AD-210 385.
Order from LC mi$3.00, ph$6.30 PB 139 996

The structure of ammonium chlorite has been determined using three dimensional Fourier and Least Squares refinement of the parameters. The previously published structure is shown to be incorrect.

California U., Los Angeles.
REFINEMENT OF THE CRYSTAL STRUCTURES OF SODIUM CHLORATE AND POTASSIUM CHLORATE, by J. G. Bower, R. A. Sparks, and K. N. Trueblood. Technical note no. 6 on Perchlorates, Contract AF 18(600)857. Jan 59, 31p. 29 refs. AFOSR TN-59-104; AD-210 386.
Order from LC mi$3.00, ph$6.30 PB 139 994

The crystal structures of sodium chlorate and potassium chlorate have been reinvestigated with three-dimensional visual x-ray intensity data obtained with CuKa radiation. Each structure has been refined by Fourier and least squares methods.

Clevite Research Center, Cleveland, Ohio
STUDY OF METHOD FOR IMPROVING THE QUALITY OF SYNTHETIC QUARTZ, by Frank Augustine. Quarterly rept. no. 2, 15 Sep-14 Dec 56,

on Contract DA 36-039-sc-72415. 25 Jan 57, 18p. 5 refs.
Order from LC mi$2.40, ph$3.30 PB 140 125

Using X-ray darkening as a criterion, synthetic quartz showed a higher degree of purity than the X-growth nutrient when grown on a (zy) plate. This provided a surface for growth in the Z-direction. Purification of quartz grown on an (xy) plate was also obtained from X-growth nutrient but to a lesser degree than on the Z-surface. To combat contamination of solvent by the steel wall of the pressure vessel, the interior of a small experimental autoclave was plated with gold.

Clevite Research Center, Cleveland, Ohio
STUDY OF METHODS FOR IMPROVING THE QUALITY OF SYNTHETIC QUARTZ, by Frank Augustine. Quarterly rept. no. 3, 15 Dec 56-14 Mar 57, on Contract DA 36-039-sc-72415. 9 Apr 57, 19p. 9 refs. AD-131 512.
Order from LC mi$2.40, ph$3.30 PB 140 124

Methods of obtaining more critical control of the growing process are being investigated. Experiments are being conducted to detect dislocations in synthetic quartz. Surfaces irregularities and etch patterns of polished and natural surfaces were studied and photographed. (See also PB 140 125)

Clevite Research Center, Cleveland, Ohio.
STUDY OF METHODS FOR IMPROVING THE QUALITY OF SYNTHETIC QUARTZ, by Frank Augustine. Quarterly rept. no. 4, 15 Mar-14 June 57, on Contract DA 36-039-sc-72415. 26 July 57, 20p. 2 refs.
Order from LC mi$2.40, ph$3.30 PB 140 123

A correspondence between growth hillocks and etch pits on prism faces of synthetic quartz has been established. Etch pits that extend some distance into the crystal occurred on major-R, minor-r, X- and Z-surfaces of synthetic quartz crystals. Many pits terminated at liquid-vapor and solid inclusions. (See also PB 140 124)

Clevite Research Center, Cleveland, Ohio.
STUDY OF METHODS FOR IMPROVING THE QUALITY OF SYNTHETIC QUARTZ, by Frank Augustine. Progress rept. no. 5, 15 June-14 Oct 57, on Contract DA 36-039-sc-72415. 18 Nov 57, 23p. 9 refs.
Order from LC mi$2.70, ph$4.80 PB 140 122

A similarity of the spectra of the minus X-grown quartz with that of silicate glasses of low alkali content is noted. Good quality quartz on Z-surfaces was obtained by increasing the alkali concentration from .1 to .83 molar and eliminating the baffle restriction. Several synthetic quartz crystals grown at a slow rate have been submitted for Q-measurements. (See also PB 140 123)

Clevite Research Center, Cleveland, Ohio.
STUDY OF METHODS FOR IMPROVING THE QUALITY OF SYNTHETIC QUARTZ, by Frank Augustine. Quarterly rept. no, 6, 15 Oct 57-14 Jan 58, on Contract DA 36-039-sc-72415. 15 Feb 58, 46p. 8 refs.
Order from LC mi$3.30, ph$7.80 PB 140 121

The absorption spectra of X-irradiated Z-, plus X-and minus X-growth quartz produced in the absence of added aluminum are presented. The spectra of X-irradiated germanium-doped minor-r synthetic quartz are compared with those of germanium-free minor-r synthetic quartz and natural quartz. Fissure flaws in quartz grown in small autoclaves are believed to be related to a high crystallizing temperature, and to poor diffusion of reacting species. (See also PB 140 122)

Columbia U., New York.
CRYSTAL CHEMICAL PHYSICS, by George K. Fraenkel and Ralph S. Halford. Quarterly rept. no. 1, 1 Oct-31 Dec 55, on Contract DA 36-039-sc-70148. [1955] 7p. 2 refs. CU-1-56-sc-70148-chem.
Order from LC mi$1.80, ph$1.80 PB 136 601

Spectroscopic investigations of infrared absorption anisotropy in thin single crystals of acetylene were completed. Single crystal specimens of cyclopropane were produced and study of their infrared absorption anisotropy was begun.

Columbia U., New York.
CRYSTAL CHEMICAL PHYSICS, by George K. Fraenkel and Ralph S. Halford. Quarterly rept. no. 2, 1 Jan-31 Mar 56, on Contract DA 36-039-sc-70148. [1956] 7p. CU-2-56-sc-70148-chem.
Order from LC mi$1.80, ph$1.80 PB 136 602

Spectroscopic observations of infrared absorption and its anisotrophy in thin single crystals of cyclopropane were completed. The processing of data previously collected with single crystals of acetylene was continued and interpretation begun. (See also PB 136 603, 136 601)

Columbia U., New York
CRYSTAL CHEMICAL PHYSICS, by George K. Fraenkel and Ralph S. Halford. Quarterly rept. no. 3, 1 Apr-30 June 56, on Contract DA 36-039-sc-70148. [1956] 8p. 1 ref. CU-3-56-sc-70148-chem.
Order from LC mi$1.80, ph$1.80 PB 136 604

The frequency linearizer, designed to eliminate the bottleneck associated with highly tedious aspects of data processing, was completed and tested. Performance is highly satisfactory and we anticipate accordingly that data collected in the future will come to hand directly in exactly the form desired for final presentation and interpretation. A single crystal of 1,2 dichloroethane, a substance exhibiting an order-disorder transition that has been well characterized by X-ray diffraction, was investigated spectroscopically at a number of temperatures ranging from below -100°K to the melting point. Some indications of the oncoming transition appear to be discernible even at the lowest temperatures, far below the λ-point. The data were collected, unfortunately, prior to the completion of our new accessory, and although of excellent quality will require lengthy processing before they can be reported. (See also PB 136 602)

Columbia U., New York.
CRYSTAL CHEMICAL PHYSICS, by George K. Fraenkel and Ralph S. Halford. Quarterly rept. no. 4 [pt. 1] 1 July-30 Sep 56, on Contract DA 36-039-sc-70148. [1956] 67p. 134 refs. CU-4-56-sc-70148-Chem. [pt. 1].
Order from LC mi$3.90, ph$10.80 PB 136 605

This report includes:
The infrared spectrum of a single crystal of 1, 2-dichloroethane, by Murray Gershenzon (Doctoral thesis)

A single crystal of 1, 2-dichloroethane, a substance exhibiting an order-disorder transition that has been well characterized by X-ray diffraction, was grown and investigated spectroscopically at a number of temperatures. The findings and their interpretations in terms of the order-disorder process are presented here in final form. The thesis is concluded in Part 2, PB 136 606. (See also PB 136 604)

Columbia U., New York.
CRYSTAL CHEMICAL PHYSICS, by George K. Fraenkel and Ralph S. Halford. Quarterly rept. no. 4 [pt. 2] 1 July - 30 Sep 56, on Contract DA 36-039-sc-70148. [1956] 65p. 11 refs. CU-4-56-sc-70148-Chem. [pt. 2].
Order from LC mi$3.90, ph$10.80 PB 136 606

Includes:
The infrared spectrum of a single crystal of 1, 2-dichloroethane, by Murray Gershenzon (Doctoral thesis) (See also PB 136 605)

Columbia U., New York.
CRYSTAL CHEMICAL PHYSICS, by George K. Fraenkel and Ralph S. Halford. Quarterly rept. no. 5, 1 Oct-31 Dec 56, on Contract DA 36-039-sc-70148. [1956] 85p. 26 refs. CU-5-56-sc-70148-chem.
Order from LC mi$4.80, ph$13.80 PB 136 607

This report includes:
Anisotropy of infrared absorption in a single crystal of acetylene, by Esther Krikorian (Doctoral thesis)

Single crystals of acetylene were grown and studied spectroscopically. The anisotropic structure, stable below -140° C, has not been characterized successfully by X-ray diffraction but our spectroscopic data indicate that it is orthorhombic, centrosymmetric and probably of class D_{2h}, with either two or four molecules per unit cell. The spectra of crystalline acetylene exhibit striking, new, complex features not observed heretofore in crystals of other substances studied previously. (See also PB 136 605)

Columbia U., New York.
CRYSTAL CHEMICAL PHYSICS, by George K. Fraenkel and Ralph S. Halford. Quarterly rept. no. 6, 1 Jan-31 Mar 57, on Contract DA 36-039-sc-70148. [1957]15p. 3 refs. CU-2-56-sc-70148-Chem.
Order from LC mi$2.40, ph$3.30 PB 136 608

An attempt was made to synthesize 2, 7 dibenzoyl 9, 10 dihydrophenanthrene by means of the Friedel Crafts reaction. Single crystals of cyclopropane were grown, and studied spectroscopically. Our data indicate that the crystal structure of this material is orthorhombic. Analysis and interpretation of the data are continuing. (See also PB 136 607)

Columbia U., New York.
CRYSTAL CHEMICAL PHYSICS, by George K. Fraenkel and Ralph S. Halford. Quarterly rept. no. 7, 1 Apr-30 June 57, on Contract DA 36-039-sc-70148. [1957] 7p. 1 ref. CU-2-56-sc-70148-Chem.
Order from LC mi$1.80, ph$1.80 PB 136 609

An attempt was made to synthesize 2, 7, dibenzoyl 9, 10 dihydrophenanthrene by building up the ring system from intermediates containing the groups in the required positions. Attempts were made to grow single crystals of ethylene, cyclopentane, cyclobutane, and allene. A crystal of ethylene was grown, but could not be preserved due to temperature limitations of the apparatus. Single crystals of the high-temperature forms, and microcrystalline sections of the low-temperature forms, of cyclopentane and cyclobutane were grown, and spectra taken. Operational difficulties have prevented the growth of single crystals of the low temperature forms so far. Attempts to grow single crystals of allene are now being carried on, and analysis and interpretation of the cyclopropane data are continuing.

Columbia U., New York.
CRYSTAL CHEMICAL PHYSICS, by George K. Fraenkel and Ralph S. Halford. Quarterly rept. no. 8, 1 July-31 Dec 57, on Contract DA 36-039-sc-70148. [1957] 6p. 3 refs. CU-8-57-sc-70148-Chem.
Order from LC mi$1.80, ph$1.80 PB 136 610

A literature survey of the reactions and methods of preparation of metal ketyls has been made. It is being organized for presentation at a later date. A vacuum system for the preparation of oxygen-free samples of metal ketyls was constructed. Repeated attemps were made to grow single crystals of allene, with the observation of anomalous behavior in its growth patterns and crystal formation. A sufficiently large section of oriented crystal of allene was grown, and spectroscopic investigations are now being carried out. Further attempts to grow single crystals of the low temperature form of cyclobutane were defeated by various instrumental failures, necessitating a minor redesigning of the equipment. This has been done, and experiments are now proceeding. (See also PB 136 609)

Columbia U., New York.
CRYSTAL CHEMICAL PHYSICS, by George K. Fraenkel, Ralph S. Halford and others. Final rept. for 1 Oct 55-31 Dec 58 on Contract DA 36-039-70148. [1958] 31p. 4 refs. CU-9-58-sc-70148-Chem.
Order from LC mi$3.00, ph$6.30 PB 140 016

An improvement was made in the method used for the preparation of solutions of the metal ketyls. Sections of allene and ethylene single crystals have been produced and examined spectroscopically. The raw spectroscopic data have been tabulated, evaluated and analyzed.

Columbia U., New York.
INVESTIGATIONS IN THE MATHEMATICAL THEORY OF VIBRATIONS OF ANISOTROPIC BODIES, by R. D. Mindlin. Quarterly rept. no. 2, 1 July-30 Sep 52, on [Contract DA 36-039-sc-15481]. [1952] 6p. 3 refs. CU-2-52-SC-15481-CE.
Order from LC mi$1.80, ph$1.80 PB 139 823

Contents:
Vibrations of contoured, thickness-shear plates
Vibrations of thickness-shear plates with incomplete electrodes
Thickness-shear vibrations of a circular disk

Columbia U., New York.
INVESTIGATIONS IN THE MATHEMATICAL THEORY OF VIBRATIONS OF ANISOTROPIC BODIES, by R. D. Mindlin. Quarterly rept. no. 3, 1 Oct-31 Dec 52, on Contract DA 36-039-sc-15481. [1952], 7p. 5 refs. CU-3-52-SC-15481-CE.
Order from LC mi$1.80, ph$1.80 PB 139 822

Contents:
Vibrations of contoured, thickness-shear plates
Longitudinal and torsional vibrations of a quartz rod

Columbia U., New York.
PARAMAGNETIC RESONANCE AND THERMOCHROMISM, by Walter G. Nilsen. Doctoral thesis. Appendix to Quarterly rept. no. 2, 1 Jan-31 Mar 56, on Crystal Chemical Physics, Contract DA 36-039-sc-70148. [1956] 106p. 69 refs. CU-2-56-sc-70148-Chem.
Order from LC mi$5.70, ph$16.80 PB 136 603

The paramagnetic properties of certain thermochromic compounds have been investigated by paramagnetic resonance methods. Of particular interest were the solutions of some organic compounds in which the thermochromic effect has been interpreted as being due to the increase, with increasing temperature, in the concentration of a colored species in equilibrium with a colorless species. Quantitative paramagnetic resonance measurements were performed on dimethylphthalate solutions of 2,2'-dimethoxybianthrone. Solutions of certain pyrylospirans are not found to be paramagnetic.

Columbia U., New York.
QUARTERLY REPORT NO. 1. [Rept. on Contract DA 36-039-sc-15481]. 30 June 52, 8p. 2 refs.
Order from LC mi$1.80, ph$1.80 PB 140 086

Contents:
Vibrations of contoured, thickness-shear plates
Vibrations of thickness-shear plates with incomplete electrodes
Thickness-shear vibrations of a circular disk

Detroit U., Mich.
STUDY OF PROPERTIES OF SINGLE CdS and ZnS CRYSTALS FOR USE AS DETECTORS IN CRYSTAL COUNTERS, by S. J. Czyzak, H. Payne and others. Technical rept. no. 3, 1 Sep 56-31 Aug 57, on Contract Nonr-1511(01). Oct 57, 56p. 15 refs.
Order from LC mi$3.60, ph$9.30 PB 136 471

Although various methods have been developed for growing single CdS and ZnS crystals, the procedure will have to be further modified in order to produce crystals with much lower impurity content than at present (.0001%). There is reason to believe that the amount of impurities which are contained in crystals at present are still sufficiently high to affect the electrical and optical properties. The method for describing the electronic charge distribution has been tested for copper and appears to be satisfactory. Index of refraction, and absorption measurements as a function of the wavelength (from cut-off to 9μ) do not reveal any resonances in the region examined. While a change in lattice constants is obtained when impurities are added, it appears as though the electrical and optical properties are far more sensitive to impurity additions. In studying the dielectric constant, dissipation factor, and resistivity, a considerable effort was placed on the method of depositing the electrodes on the crystal.

Diamond Ordnance Fuze Labs., Washington, D. C.
TEMPERATURE DEPENDENCE OF MICROWAVE PERMEABILITIES FOR POLYCRYSTALLINE FERRITE AND GARNET MATERIALS, by J. Nemarich and J. Cacheris. 3 Oct 58, 22p. 11 refs. TR-647
Order from LC mi$2.70, ph$4.80 PB 140 059

Measurements of the microwave permeabilities $\mu_{||}$ and $\mu_{\perp} = (\mu^2 - \chi^2)/\mu$ were made at a frequency of 9230 Mc using a cavity perturbation technique. The temperature ranged from 25° to 150° C and the magnetic fields were varied from zero to 2000 oersteds. Both $\mu_{||}$ and $\mu_{\perp}$ were found to increase with increasing temperature and decreasing magnetization in the range of magnetic fields investigated.

Electrical Engineering Research Lab., U. of Illinois, Urbana.
THE CONDUCTANCE OF A CLEANED GERMANIUM SURFACE, by William Portnoy and Paul Handler. Technical note no. 2 on Contract AF 49(638)417. 20 Mar 59, 81p. 23 refs. AFOSR-TN-59-132; AD-210 840.
Order from LC mi$4.80, ph$13.80 PB 139 998

The conductivity and field effect mobility of the carriers in the region of the space charge of a cleaned germanium surface were measured as a function of various gas ambients and as a function of temperature. The number of holes in the region of the space charge does not change by more than a factor of two over the range of temperature investigated.

Electrical Engineering Research Lab., U. of Illinois, Urbana.
EFFECT OF ION BOMBARDMENT ON SEMICONDUCTOR SURFACES, by Stephen R. Arnold. Technical note no. 1 on Contract AF 49(638)417. 20 Mar 59, 101p. 36 refs. AFOSR-TN-59-131; AD-210 839.
Order from LC mi$5.70, ph$16.80 PB 139 999

Measurements of surface properties of etched germanium surfaces were carried out before and

after bombardment by 500 and 1000 volt oxygen ions. Bombardment is shown to have the general effect of increasing the surface state density without causing major changes in the trapping structure.

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
DISORDERED LATTICE PROBLEM; A REVIEW, by Alexei A. Maradudin and George H. Weiss. Rept. on Contract AF 18(600)1015. Apr 58, 28p. 19 refs. Technical note no. BN-132; AFOSR TN-58-372; AD-154 278.
Order from LC mi$2.70, ph$4.80 PB 135 362

This paper presents a review of the disordered lattice problem which arises in the study of thermodynamic properties of binary alloys. The first work on this problem was done by Dyson who reduced the one dimensional problem to the solution of a non-linear integral equation. Further investigations have been made of the one-dimensional problem, but no substantial progress has been reported to date. Other approximate procedures based on perturbation theory are discussed.

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
THE VIBRATION SPECTRA OF DISORDERED LATTICES, by C. Domb, A. A. Maradudin and others. Rept on Contracts AF 18(600)1315 and AF 49(638)399. Oct 58, 10p. 6 refs. Technical note BN-153; AFOSR TN-58-1123; AD-207 832.
Order from LC mi$1.80, ph$1.80 PB 138 509

Using the Moment-Trace method, the vibrational frequency spectrum of a randomly disordered, two-component, isotopic linear chain has been computed for a wide range of the concentrations of the two kinds of particles and of the mass ratio.

Institute of Mathematical Sciences, New York U., N. Y.
PREPARATION OF THIN ANTHRACENE SINGLE CRYSTALS, by H. Kallmann and M. Pope. Technical rept. on Contract Nonr-285(25). 9 June 58, 3p.
Order from LC mi$1.80, ph$1.80 PB 140 085

Istituto Elettrotecnico Nazionale "Galileo Ferraris" (Italy).
INSTABILITY OF THE BLOCH WALLS DUE TO INTERSTITIAL ATOMS IN THE FERROMAGNETIC LATTICE, by Giuseppe Biorci, Andrea Ferro and Giorgio Montalenti. Technical rept. 1c(Final) on Contract AF 61(514)1331. Mar 58, 41p. 26 refs. AFOSR TR-58-61; AD-158 204.
Order from LC mi$3.30, ph$7.80 PB 135 389

The possibility of experimentally verifying Néel's theory of the diffusion viscosity has been studied. It turns out that the theory is quantitatively valid only at conveniently low field strength. In fact, above a critical field, the Bloch walls find an instability position. The role of the instability is essential to explain the viscosity field curves experimentally observed.

ITT Labs., Nutley, N. J.
RESEARCH ON GROWING CRYSTALS OF FERRIMAGNETIC OXIDES, by A. J. Marino, Jr. Scientific rept. no. 7 for 1 Oct-31 Dec 58 on Contract AF 19(604)2261. Jan 59, 9p. 1 ref. AFCRC TN-59-123; AD-210 082.
Order from LC mi$1.80, ph$1.80 PB 140 063

The flameless fusion method of growth using r-f induction heating and powder feed was investigated. 24 crystals of magnesium, manganese, cobalt-substituted manganese and cobalt have been grown using the technique.

Louvain U. (Belgium).
STUDIES ON THE MECHANISMS OF ELECTROLUMINESCENCE, by A. Luyckx, J. Vandewauwer, and S. Ries. Technical notes 2, 15 Nov 57-15 June 58, on Contract AF (514)1118. [1958] 21p. 8 refs. AFOSR TN 58-875; AD-203 913.
Order from LC mi$2.70, ph$4.80 PB 136 566

ZnS single crystals prepared by sublimation were E. L. only after activation. The threshold of E. L. in a. c. field is of 500 volts/cm. Electrode zones give more intense glows. The brightness waves excited by half-wave field show a peak in phase with the field. This peak is mostly due to anodic zone. Experiments were done on nine crystals prepared by the same method. Two sorts of crystals were identified. Sort I shows a reverse current at the end of a half-wave field excitation. There is coincidence between the peak of this current and the out-of-phase light peak. This light is attributed to electrons under the influence of the space-charge field. Sort II gives no reverse current. The current wave and brightness wave are in phase with the field. With d. c. applied fields, some crystals show glows in the anodic region. Inversion of polarity provokes migration of the glowing zone towards the new anode. This was attributed to the migration of ions. Brightness waves obtained with half-wave excitation fields are not the same after d. c. field has been applied. The in-phase peak is less important; d. c. field modifies the crystal.

Loyola U., New Orleans, La.
FINAL REPORT ON CONTRACT Nonr 1573(01), by Paul B. Pickar. Rept. for 14 Oct 56-15 July 57, 40p. 6 refs.
Order from LC mi$3.00, ph$6.30 PB 140 117

A study was made of the electrical properties of single Crystals of PbTe and PbSe grown by the Bridgman - Stockbarger method. Hall voltages and resistivity were measured as a function of magnetic field and temperature from 353°K to 77°K. Hall Coefficients were calculated from Hall curves which had been corrected for I R drop, as well as the Nernst and Ettingshausen effects. Most of the PbTe Crystals grown were of the n-type.

Massachusetts Inst. of Tech., Cambridge.
INTERACTION OF WAVES IN CRYSTALS, by John C. Slater. Technical rept. no. 10 on Contract Nonr-1841(34). 15 Sep 57, 60p. 260 refs.
Order from LC mi$3.60, ph$9.30 PB 135 720

Contents:
The general nature of waves in crystals and their interactions
Scattering of an electronic wave by a sinusoidal perturbation
Scattering of an electromagnetic wave by a sinusoidal perturbation
Energy bands in crystals
The thermal vibrations of a crystal
Scattering of x-rays by thermal oscillations
Scattering of electrons and neutrons by thermal oscillations
The compton effect
Bibliography

Massachusetts Inst. of Tech., Cambridge.
POLARIZED NEUTRON STUDIES ON ANTIFERROMAGNETIC SINGLE CRYSTALS, by R. Nathans (Pennsylvania State U.), T. Riste (Brookhaven National Lab.) and others. Technical rept. no. 4 on Contract AF 18(603)84. 26 Nov 58, 12p. 12 refs. AFOSR TR-58-1058; AD-206 986.
Order from LC mi$2.40, ph$3.30 PB 140 015

Using single crystals of Cr_2O_3 and α - Fe_2O_3 in which reside unique antiferromagnetic axes, studies were made on several different reflections in both crystals for a number of different temperatures both below and above the Neel point. The principal source of the parasitic ferromagnetism in hematite is essentially independent of the orientation of the antiferromagnetic domains within the crystal.

Massachusetts Inst. of Tech., Cambridge.
SOLID-STATE AND MOLECULAR THEORY GROUP. Quarterly progress rept. no. 27 on Contract Nonr-1841(34). 15 Jan 58, 64p. 2 refs.
Order from LC mi$3.90, ph$10.80 PB 138 444

Contents:
Average energies of configurations of iron group atoms and ions
Atomic calculations
Compton scattering of X-rays
X-ray atomic scattering factors
Electron population analysis and dipole moments: HF and LiH
Electronic wave functions for the hydrogen fluoride molecule
Electronic wave functions for simple molecules
Electron coupled interaction between nuclear spins in the HD molecule
Density of states and X-ray emission for KCl
Energy bands in iron
Energy bands in potassium
Bimolecular semiconducting compounds

Miami U., Coral Gables, Fla.
COHESIVE ENERGY AND WAVE FUNCTIONS FOR RUBIDIUM, by Joseph Callaway and Daniel F. Morgan, Jr. Technical rept. no. 10 on Contract Nonr-840(06). June 58, 11p. 10 refs.
Order from LC mi$2.40, ph$3.30 PB 139 875

A value of 20.7 k-cal/mol was obtained for the cohesive energy, including k^4 terms in the Fermi energy, but neglecting any polarization effects.

Miami U., Coral Gables, Fla.
EFFECTIVE MASS OF ELECTRONS IN GALLIUM ARSENIDE, by L. C. Barcus, A. Perlmutter, and J. Callaway. Technical rept. no. 8 on Contract Nonr-1420(00). [1957] 8p. 6 refs.
Order from LC mi$1.80, ph$1.80 PB 138 442

The effective mass of electrons in a sample of n type Gallium Arsenide has been measured by determining the reflectivity in the infrared. The value obtained $0.043 \pm 0.005\ m_o$ supports the hypothesis that the minimum of the conduction band is at the center of the Brillouin Zone.

Miami U., Coral Gables, Fla.
ELECTRON ENERGY BAND THEORY OF SOLIDS, by Joseph Callaway. Final rept. on Contract Nonr-840(06). June 58, 12p. 6 refs.
Order from LC mi$2.40, ph$3.30 PB 139 874

Cohesive energies of the alkali metals; potassium, rubidium, cesium, lithium and sodium. Wave functions in the alkali metals, and polarization and relativistic effects.

Michigan State U., East Lansing.
DIPOLE SCATTERING IN SEMICONDUCTORS, by Robert R. Slocum. Rept. on Contract AF [49](638)70. June 58, 7p. 4 refs. AFOSR TN-58-472; AD-158 283.
Order from LC mi$1.80, ph$1.80 PB 135 161

Recent work on semiconductors suggested consideration of dipole scattering effects in these substances. Using a formulation due to Massey for scattering centers of polar symmetry the cross-sector for dipole scatterers was calculated, and subsequently a relaxation time obtained.

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
TRANSMISSION LINE FORMULATION FOR SEMICONDUCTORS, by Philip Parzen. Quarterly rept. no. 9 for 1 July-30 Sep 58 on Contract DA 36-039-sc-73052. 29 Oct 58, 8p. 1 ref. Rept. no. R-523.26-58; PIB-453.26.
Order from LC mi$1.80, ph$1.80 PB 140 019

A more suitable test function for the variational method of computing the scattering coefficient T_{ij} is given. This test function satisfies the Bloch condition and should give accurate results. A discussion of one dimensional band structure based upon orthogonality considerations is described which leads to some general results. The outline for an interim phase report is also given.

Pacific Semiconductors, Inc., Culver City, Calif.
STUDY OF SURFACES IN SEMICONDUCTOR DEVICES, by T. C. Hall and M. F. Millea. Quarterly technical rept. no. 1, 15 June-15 Sep 58, on Contract DA 36-039-sc-78049. 3 Oct 58, 40p. 9 refs. PSI rept. no. 300:21-1-Q.
Order from LC mi$3.30, ph$7.80 PB 139 830

Conventionally etched n- and p-type silicon is left with surface states in the intrinsic region. A 7% sodium

hydroxide etched n-type specimen is found to have a p-type surface. Experimental data are offered which indicate that the assumption of less than complete diffused scattering of carriers at the surface of silicon and germanium is more reasonable than the complete diffused scattering previously assumed.

Philco Corp., Lansdale, Pa.
INDUSTRIAL PREPAREDNESS STUDY ON DIFFUSED SEMICONDUCTOR DEVICES, by J. D. McCotter and C. G. Thornton. Quarterly progress rept. no. 1, 1 May-31 July 57, on Contract DA 36-039-sc-72705. [1957] 48p.
Order from LC mi$3.30, ph$7.80 PB 138 099

Several improvements have been made in the process and equipment to increase the rate and uniformity of the diffused blanks. The cyanide treatment for reconversion of diffused germanium blanks has been virtually eliminated. The accuracy and rate of performing the switching-time measurements on this device has been considerably improved by the addition of a traveling-wave type oscilloscope and a closed-circuit industrial TV system.

Philco Corp., Lansdale, Pa.
INDUSTRIAL PREPAREDNESS STUDY ON DIFFUSED SEMICONDUCTOR DEVICES, by J. D. McCotter and C. G. Thornton. Quarterly progress rept. no. 2, 1 Aug-31 Oct 57, on Contract DA 36-039-sc-72705. 64p.
Order from LC mi$3.90, ph$10.80 PB 138 100

The storage time characteristics of the L-5400 were markedly improved by the substitution of a smaller emitter rough etching jet. Graphs illustrating this change are included in this report. Production yield figures for two consective months of this reporting period are given. The yield percentages for each stage of the fabrication process are shown. A comparison of the first and second month's fabrication process efficiency can be made. (See also PB 138 099)

Research Inst. of Science and Engineering, U. of Detroit, Mich.
ANALYSIS OF ELASTIC AND PLASTIC STRAINS OF A FACE-CENTERED CUBIC CRYSTAL, by T. H. Lin. Technical note on Contract AF 18(600)1466. July 56, 26p. 9 refs. AFOSR TN-56-307; AD-94 841.
Order from LC mi$2.70, ph$4.80 PB 124 806

A method of analysis of both the elastic and plastic shear strains in a face-centered cubic crystal with twelve slip systems, under a given path of strain, is shown. The consideration of elastic strain gives the sequence of different active slip systems in the process of loading. This enables the calculation of the transition from one set of active slip systems to another for a crystal deformed under varying ratios of principal strains. An illustrative example of calculating the five active slip systems of a crystal under uniaxial loading is shown. The five active slip systems calculated for this crystal, by the present method check exactly with Taylor's results.

Warner and Swasey Research Corp., New York.
EFFECTS OF TEMPERATURE GRADIENTS ON SELF-ABSORPTION OF INFRARED RADIATION IN HOT GASES, by Richard H. Tourin. Scientific rept. no. 1 on Contract AF 19(604)2223. July 58, 22p. 13 refs. AFCRC TN-58-462; AD-152 622.
Order from LC mi$2.70, ph$4.80 PB 136 052

The intensity distribution in the infrared emission spectrum of a hot gas stream depends to a large extent on self-absorption within the gas. This self-absorption depends not only on the magnitude of the spectral absorption coefficients, but also on the temperature gradient along the optical path through the gas. Calculations were carried out to obtain estimates of the radiation contributions to the 4.3 micron emission band of CO_2 from zones of a stream of combustion exhaust gases at various temperatures, for typical temperature distributions encountered in practice. The calculations were based on $\Sigma_u^+ - \Sigma_g^+$, $\pi_u - \pi_g$, etc., vibrational transitions of the form $0_n{}^v1 - 0_n{}^v0$ (where n = 0, 1, 2, etc.), which have been shown to predominate in this spectral region, using measured emissivities of CO_2. The temperature dependence of rotational energy distribution was accounted for in each vibrational transition. The calculated spectral contours were compared to measured spectra obtained with a special burner, in which known temperature gradients could be set up at will. The results are useful in estimating the energy emitted by hot gas streams and for analyzing temperature distributions within a flame.

Wesleyan U., Middletown, Conn.
MANUAL OF MODE-FORM DATA FOR RECTANGULAR AT-CUT QUARTZ PLATES COMPUTED FROM MINDLIN'S SOLUTIONS, by Karl S. Van Dyke and A. C. Anderson. Rept. no. 3 (semi-annual) on Piezoelectric Crystal Studies and Measurements, Contract DA 36-039-sc-71154. 1 July 57, 34p. 5 refs.
Order from LC mi$3.00, ph$6.30 PB 140 119

Westinghouse Electric Corp., Youngwood, Pa.
RESEARCH IN THE PREPARATION OF HYPERPURE SINGLE CRYSTAL SILICON CARBIDE, by J. R. O'Connor. Scientific rept. no. 4, 31 Mar-29 Aug 58, on Contract AF 19(604)2174. [1958] 35p. 10 refs. AFCRC-TN-58-583; AD-206 904.
Order from LC mi$3.00, ph$6.30 PB 140 092

Single crystals of pure SiC obtained to date contain less than twenty parts per million total impurities, and may easily be a factor of two or more below this figure. The crystals are quite transparent and are of 10^3 to 10^5 ohm cm resistivity. The mechanisms of purification are examined.

Willow Run Labs., U. of Michigan, Ann Arbor.
LUMINESCENCE OF COLOR CENTERS IN KCl, by John Baker and John Lambe. Rept. on Contract AF 49(638)68. Jan 59, 18p. 9 refs. Rept. no. 2616-5-T; AFOSR-TN-58-914; AD-204 566.
Order from LC mi$2.40, ph$3.30 PB 139 565

Absorption excitation and emission studies of color centers in KCl crystals have been performed. A number of new absorption and emission bands have been

discovered and tabulated along with the basic color centers. The interactions produced by bleaching with F band light have been shown to have some regularity for the observed emission bands. This interaction is discussed in detail and traced through its various stages.

Theoretical Physics

Johns Hopkins U., Baltimore, Md.
CLASSICAL APPROACH TO A THEORY OF RELAXATION PROCESSES, by Robert W. Zwanzig. Rept. on Contract Nonr-248(10). June 58, 18p. 11 refs.
Order from LC mi$2.40, ph$3.30 PB 140 116

The theory of Brownian motion is generalized to include the case where the period of the system is very short, compared with times characteristic of its interaction with the environment. The system is described in terms of action and phase variables, which are constants of the motion in the absence of interactions.

Michigan U., Ann Arbor.
THE KINETIC THEORY OF PHENOMENA IN DENSE GASES, by S. T. Choh and G. E. Uhlenbeck. Doctoral thesis. Rept. on Contract Nonr-1224(15). Feb 58, 104p. 37 refs.
Order from LC mi$5.70, ph$16.80 PB 138 502

The purpose of this dissertation is to elucidate the Bogolubov theory as much as possible and to carry out the theory till the hydrodynamical stage (which Bogolubov only indicated), in order to obtain the formal expressions for the viscosity coefficients and heat conductivities of a dense gas.

Stanford U., Calif.
QUANTUM ELECTRODYNAMICS AT SMALL DISTANCES, by S. D. Drell. Technical rept. no. 24 on Contract AF 18(600)545. Jan 58, 26p. 23 refs.
AFOSR TN-58-46; AD-148 086.
Order from LC mi$2.70, ph$4.80 PB 133 353

The validity of quantum electrodynamics (QED) at small distances is discussed in the light of present experimental information. Large-angle pair production in hydrogen, together with elastic electron-proton scattering, is analyzed as a means of obtaining further information on the small distance behavior of QED.

Syracuse U., N. Y.
STRUCTURE OF PARTICLES IN LINEARIZED GRAVITATIONAL THEORY, by R. Sachs and P. G. Bergmann. Technical note P-14 on Contract AF 18(600)459. Apr 58, 30p. AFOSR TN-58-374; AD-154 281.
Order from LC mi$2.70, ph$4.80 PB 134 758

The report examines the invariant character of restrictions imposed on singularities or other sources of the gravitational fields in the EIH theory of motion in General Relativity. We have succeeded in providing a complete classification of sources that can occur in the linearized theory only, in terms of properties that are invariant under Lorentz and "gauge" transformations (the latter designation refers to linearized curvilinear coordinate transformations.

Thermodynamics

Aeronutronic Systems, Inc.,
METHODS FOR CALCULATING THERMODYNAMIC AND OPTICAL PROPERTIES OF AIR, by Gilbert N. Plass, Harris L. Mayer and others. Rept. on Contract AF 29(601)455. 2 Aug 57, 181p. 17 refs.
ASI rept. U-092; AFSWC TR-57-34; AD-143 809.
Order from LC mi$8.40, ph$28.80 PB 140 077

Three theoretical approaches to calculating the thermodynamic and optical properties of air at temperatures of 2 to 20 ev and densities of 10 to 10^{-6} times sea level density are examined. Both the independent electron method and the ionic method of determining occupation numbers are derived by the grand canonical ensemble. A numerical comparison between the two methods shows the limitations of the former at temperatures below 10 ev. The hydroelectrodynamic model of the atom, used by Wheeler and Fireman to calculate the radiative absorption cross section for a zero temperature atom, is extended to apply to high temperatures. Time estimates are given for programming and running calculations by these three methods. The elements required for relevant experiments on the opacity coefficient of air between 2 and 20 ev are examined. Some specific experiments using reflected shocks, colliding shocks, or pinch effect are suggested.

Arizona State Coll., Tempe.
THE MEASUREMENT OF THERMAL DIFFUSIVITY USING A SOLAR FURNACE, by Clement J. Kevane. Rept. on Contract Nonr-2140(00). June 58, 68p. 25 refs.
Order from LC mi$3.90, ph$10.80 PB 139 847

In order to develop a method for measurement of thermal diffusivity of materials, the propagation of temperature waves set up by periodic modulation of the heat flux in a solar furnace was studied at moderate temperatures. The experimental results were compared with an analysis of one-dimensional heat flow under periodic excitation to determine thermal diffusivity. Because of small temperature oscillation amplitudes and rather large temperature fluctuations at the focal spot, work was limited to temperatures less than 1000°C. The results are only in rough order of magnitude agreement with known thermal diffusivities because of the temperature fluctuation noise and undetermined systematic errors.

Armour Research Foundation, Chicago, Ill.
THERMOPHYSICAL PROPERTIES OF SOLID MATERIALS, by Alexander Goldsmith and Thomas E. Waterman. Rept. for 1 June 57-31 July 58 on Thermo-

physical Data Consolidation, Contract AF 33(616)5212. Jan 59, 430p. 155 refs. WADC Technical rept. 58-476; AD-207 905.
Order from OTS $6.00 PB 151 715

Thermophysical property data for a number of solid materials are presented in both graphical and tabular form, with all entries annotated. Materials included are generally those with melting points in excess of 1000°F. This volume is the partial result of the first year's effort in a program whose objective is the compilation, evaluation and consolidation of all primary test data published since 1940. Although this report is incomplete, it is representative of the end item. The reasons for its early distribution are to disseminate usable information on many important materials and to elicit comments and suggestions for improvement of the final product.

Brown U. Div. of Engineering, Providence, R. I.
HEAT TRANSFER FROM SURFACES OF NON-UNIFORM TEMPERATURE DISTRIBUTION. PART I. LAMINAR TRANSFER FROM ISOTHERMAL HEAT POLES ON A FLAT PLATE, by H. H. Sogin. Rept. on Contract AF 49(638)46. Sep 58, 86p. 20 refs. AFOSR TN-58-930; AD-205 095.
Order from LC mi$4.80, ph$13.80 PB 139 919

A purely hydrodynamic boundary layer grows from the leading edge of a flat plate at zero incidence. Downstream is a heated, isothermal surface of finite length --- an isothermal heat pole. It is followed by a second isothermal heat pole, the surface between the two being adiabatic. The Rubesin-Klein-Tribus method is used to calculate rates of heat transfer by forced convection from the two poles. The general results are applicable to poles of any length in either laminar or turbulent flow. Predictions of laminar transfer are based on Eckert's step function. In experimentation, naphthalene cast in trays is used to simulate the isothermal heat poles while the inert material between them simulates the adiabatic wall.

Brown U. Div. of Applied Mathematics, Providence, R. I.
THERMAL SHOCK IN AN ELASTIC BODY WITH A SPHERICAL CAVITY, by Eli Sternberg and J. G. Chakravorty. Technical rept. no. 3 on Contract Nonr-562(25). June 58, 27p. 22 refs.
Order from LC mi$2.70, ph$4.80 PB 139 882

This investigation aims at the dynamic thermoelastic response of an infinite medium with a spherical cavity to a sudden uniform change in the temperature of its internal boundary. By means of the Laplace transform, a closed solution to this problem - exact within classical elastokinetics - is obtained in terms of error functions of real and complex arguments. The ensuing temperature stresses are compared with the corresponding quasi-static results.

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
RADIATIVE PROPERTIES OF HIGH TEMPERATURE AIR, by Walter H. Wurster, Herbert S. Glick, and Charles E. Treanor. Final rept. on Contract AF 29(601)176. Sep 58, 81p. 24 refs. AFSWC TR-58-35; [AD-202 319]
Order from OTS $2.25 PB 151 646

The spectral properties of high temperature air have been studied in both absorption and emission. The experimental apparatus and the data obtained in the experiments are discussed in detail. Results are presented which show that molecular oxygen plays a dominant role in the ultraviolet absorptive characteristics of air.

Cornell U., Ithaca, N. Y.
ON THE PARTITION FUNCTION OF A ONE-DIMENSIONAL GAS, by Mark Kac. Rept. no. 75 on Contract AF 49(638)226. Mar 58, 10p. 2 refs. AFOSR TN-58-201; AD-152 234.
Order from LC mi$1.80, ph$1.80 PB 140 050

An exact calculation of the partition function of a one-dimensional gas with a suitably chosen potential is given. The attractive part of the potential is "one range" and hence the interaction is not limited to a bounded number of neighbors.

Cryogenic Lab., Ohio State U. Research Foundation, Columbus.
JOULE-THOMSON EFFECTS IN COMPRESSED GASEOUS HYDROGEN, by Paul Camky, David White, and Herrick L. Johnston. Technical rept. 16 on Liquid Hydrogen as an Aircraft Fuel, Contract W33-038-ac-14794. 15 May 52, declassified 9 Feb 55. 48p. 5 refs. TR 264-16; ATI-162 585.
Order from LC mi$3.30, ph$7.80 PB 139 754

Joule-Thomson effects in hydrogen have been measured between 65° and 300° K at 5 deg intervals, for pressures up to 200 atmospheres. The method consisted in measuring the temperature drop when high pressure hydrogen was expanded through a needle valve made from thermally non-conducting materials. The apparatus used was that designed by Johnston and co-workers, with minor modifications, used previously to measure Joule-Thomson effects in hydrogen and in deuterium. The collants used were pure nitrogen, air and pure oxygen and various ones of the freons. A table of heat contents, as a function of pressure and temperature, is computed from the smooth isotherms.

Cryogenic Lab., Ohio State U. Research Foundation, Columbus.
THERMAL CONDUCTIVITIES OF LIQUID NORMAL AND OF LIQUID PARA HYDROGEN FROM 15° TO 27°K, by Robert W. Powers, Robert W. Mattox, and Herrick L. Johnston. Technical rept. 10 on Liquid Hydrogen as an Aircraft Fuel, Contract W33-038-ac-14794. [1951] declassified 6 Apr 54, 12p. 3 refs. TR 264-10; ATI-105 927.
Order from LC mi$2.40, ph$3.30 PB 139 753

The thermal conductivities of liquid normal and liquid para hydrogen have been measured over the temperature interval 15° - 27° K. They were found to be independent of the ortho-para composition and can be expressed by the equation
$K = (1.702 + 0.05573T) \cdot 10^{-4}$ cal cm^{-1} sec^{-1} deg^{-1}.

Cryogenic Lab., Ohio State U. Research Foundation, Columbus.
THERMAL CONDUCTIVITY OF LIQUID NITROGEN BETWEEN 65° AND 90°K, by Robert W. Powers, Robert W. Mattox, and Herrick L. Johnston. Technical rept. 9 on Liquid Hydrogen as an Aircraft Fuel, Contract W33-038-ac-14794. [1951] declassified 16 July 54, 24p. 6 refs. TR 264-9; ATI-105 926.
Order from LC mi$2.70, ph$4.80 PB 139 752

A cell for measuring the thermal conductivity of liquids at low temperatures is described in this paper. Data on the conductivity of liquid nitrogen from 65° to 90°K are presented.

Cryogenic Lab., Ohio State U. Research Foundation, Columbus.
THERMODYNAMIC PROPERTIES OF GASEOUS HYDROGEN FROM EXPERIMENTAL DATA OF STATE, by David White and Herrick L. Johnston. Technical rept. no. 26 on Liquid Hydrogen as an Aircraft Fuel, Contract W33-038-ac-14794. 30 Nov 53, declassified 16 May 54, 69p. TR 264-26; AD-27 622.
Order from LC mi$3.90, ph$10.80 PB 139 756

The P V T relationships of gaseous H were measured from 20° to 300°K and up to 200 atm. The data were correlated using the equation of state:

$$\frac{PV}{RT} = A + \frac{B}{V} + \frac{C}{V^2} + \frac{D}{V^3} + \frac{E}{V^4} + \frac{F}{V^5}$$ which contains 6 virial coefficients from which the thermodynamic properties were derived. The experimental data were fitted to the virial equation using a least squares solution which was obtained with the aid of IBM computers. The resulting virial coefficients were then smoothed with respect to temperature so that the resulting equation of state represented the data, on an average, to within one part in one thousand. The virial coefficients at each of the experimental temperatures are given; in all cases A is equal to 1.000 and the value R was taken as 82.0566$_7$ cc-atm/°K-mole. The virial coefficients were interpolated and extrapolated to give values at every 2° between 20° and 40°K, at every 5° between 40° and every 100°K, at every 10° between 100° and 300°K, and at every 50° between 300° and 500°K. By inserting these values into the equation of state, the density, the compressibility factor, the compressibility, and the variation of the difference between the free energy of an ideal and real gas with pressure were calculated at the desired temperatures. For the remainder of the thermodynamic properties, the first and second derivatives of the virial coefficients with respect to temperature were calculated by using Newton's formula.

Cryogenic Lab., Ohio State U. Research Foundation, Columbus.
THERMODYNAMIC PROPERTIES OF LIQUID NORMAL HYDROGEN BETWEEN THE BOILING POINT AND THE CRITICAL TEMPERATURE AND UP TO 150 ATMOSPHERES PRESSURE, by David White and Herrick L. Johnston. Technical rept. 23 on Contract W33-038-ac-14794. 1 Feb 53, declassified. 6 Apr 54, 15p. 1 ref. TR 264-23; AD-6234.
Order from LC mi$2.40, ph$3.30 PB 139 755

The thermodynamic properties of liquid normal H were calculated from the experimental data of the liquid from the bp to the critical point and up to 100 atm pressure. The data were extrapolated to pressures of 150 atm. The calculated thermodynamic properties are summarized in 6 tables, at various integral values of the temperature and pressure.

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
SELECTED TOPICS FROM THE THEORY OF GAS FLOW AT HIGH TEMPERATURES (IV), by J. M. Burgers. Rept. on Contract AF 18(600)993. July 57, 28p. Technical note BN-103; AFOSR TN-57-459; AD-136 540.
Order from LC mi$2.70, ph$4.80 PB 135 855

This fourth part considers the construction and solution of equations of transfer. First a simplified account of Ikenberry and Truesdell's development of the method of equation of transfer is given, so as to make it applicable to the calculation of higher approximations. Then part of Truesdell's formalism starting from Krook's simplified collision equation is developed so that the results will not be based exclusively on Maxwellian case.

Institute of Flight Structures, Columbia U., New York.
BASIC CONCEPTS OF THE THERMODYNAMICS OF CONTINUOUS MEDIA, by Bruno A. Boley and Jerome H. Weiner. Rept. on Effects of Atomic Weapons on Aircraft, Contract AF 33(616)3709. Apr 58, 49p. 10 refs. WADC Technical rept. 57-288; AD-151 139.
Order from LC mi$ 3.30, ph$7.80 PB 140 280

This report presents the fundamental concepts of those portions of thermodynamics of greatest use in the analysis of continuous media, with special reference to irreversible processes. The second law of thermodynamics is presented in a form suitable for non-uniform systems along the lines developed by Caratheodory for uniform systems. Applications to viscous fluids, elastic and viscoelastic solids are presented in detail.

Martin Co., Baltimore, Md.
NUCLEATE BOILING LITERATURE SEARCH, by J. J. Jicha and E. J. Lemanski. Rept. on Contract DA 44-009-eng-3043. Apr 57 56 p. 210 refs. MND-1062-1, Suppl. to MND-1062.
Order from OTS $1.50 PB 151 304

Since the realization of the potential of nuclear energy as a source of industrial power, new methods of obtaining more efficient energy recovery have received primary considerations. The nucleate boiling mode of heat transfer, because of the mechanism involved, is believed to possess great potentialities in producing a more efficient system. This survey has been compiled as the ground work in determining the magnitude of gains which may be realized in a pressurized water reactor by modification of pressure and coolant flow of the primary system to permit local boiling. It is also anticipated that a survey of this nature will function as a convenient guide in obtaining more detailed information on other aspects of nucleate boiling so

that a more complete analysis of this problem will be possible.

Massachusetts Inst. of Tech., Cambridge.
BUBBLE GROWTH RATES IN BOILING, by Peter Griffith. Technical rept. no. 8 on Contract N5ori-078(27). June 56, 36p. 11 refs. AD-113 591.
Order from LC mi$3.00, ph$6.30 PB 139 978

The conditions determining the growth rate of a bubble on a surface in boiling are considered and a mathematical model framed in the light of these conditions. The growth rate is then calculated for bubbles growing under a range of conditions of pressure, wall superheat and bulk fluid temperature. The average growth rate of a bubble is found to decrease with increasing maximum size and to decrease with increasing pressure. At high pressure the maximum size of the bubble is found to be independent of pressure and primarily a function of the thickness of the superheated layer near the surface. The calculated bubble growth velocities are then used to correlate some burnout data for a variety of fluids under a range of pressures in pool boiling. Bubble growth pictures are presented for water at atmospheric pressure under a variety of conditions.

Massachusetts Inst., of Tech., Cambridge.
CORRELATION OF NUCLEATE BOILING BURNOUT DATA, by Peter Griffith. Technical rept. no. 9 on Contract N5ori-078(27). Mar 57, 21p. 1 ref. AD-147 714.
Order from LC mi$2.70, ph$4.80 PB 139 977

A dimensionless correlation is developed for nucleate boiling burnout data including the following ranges of variables: Fluids - Water, Benzene, n-Heptane, n-Pentane, Ethanol; Pressure - 0.0045 to 0.96 of critical pressure; Velocity - 0 to 110 ft/sec: Subcooling- 0 to 280°F; Quality - 0 to 70%. The data is drawn from a variety of sources and has been collected on widely varying types of systems. Over 300 points are correlated with 94% of the points included between the ±33% envelope drawn around the best line through the points. The correlation includes only fluid properties and quantities which can be calculated on the assumption of equilibrium conditions at the burnout point.

Massachusetts Inst. of Tech., Cambridge.
EXPERIMENTAL INVESTIGATION OF HEAT TRANSFER TO FLUIDS AT SUPER-CRITICAL PRESSURES, by Sabino G. Merra and J. P. Barger. Technical rept. no. 1 on Contract Nonr-1841(14). June 58, 86p. 6 refs.
Order from LC mi$4.80, ph$13.80 PB 139 966

The performance of the experimental apparatus designed to investigate heat transfer to super-critical fluids was evaluated for ease of operation, control, reliability, reproducibility, and accuracy. Detailed descriptions of the equipment and procedures are presented. Heat transfer coefficients were calculated for runs made at supper-critical pressures but below the critical temperature.

Massachusetts Inst. of Tech., Cambridge.
THE THERMODYNAMICS OF BUBBLES, by John A. Clark. Technical rept. no. 7 on Contract N5ori-078(27). 1 Jan 56, 41p. 40 refs. AD-108 762.
Order from LC mi$3.30, ph$7.80 PB 140 365

This paper outlines those conditions demanded by the laws of thermodynamics for equilibrium between the vapor in a bubble and the surrounding liquid and then employs these concepts with a nucleation theory in an attempt to arrive at an expression relating the nucleating superheat in a pure liquid to other fluid properties. The first part of the paper deals with the phase equilibrium across a curved interface and some of its consequences. In the second part recourse is made to the kinetic theory of "Heterophase" thermal fluctuations given by Frenkel for nucleus formation which is extended and employed to derive a relationship between a superheat at nucleation and other fluid properties.

Massachusetts Inst. of Tech. Div. of [Sponsored Research] Cambridge.
VOID VOLUMES IN SUBCOOLED BOILING SYSTEMS, by Peter Griffith, John A. Clark, and Warren M. Rohsenow. Technical rept. no. 12 on Contracts N5ori-078(94) and Nonr-1848(39). 1 Mar 58, 41p. 11 refs. AD-154 429.
Order from LC mi$3.30, ph$7.80 PB 139 746

Knowledge of the pressure drop in a channel and the resulting flow redistribution is essential in predicting the performance of a nuclear reactor. The pressure drop in a channel which is experiencing boiling is, in part, dependent on the void volumes present. In this report the results of an experimental investigation of the void volumes in systems at 500, 1000, and 1500 psia are presented. A method of predicting the void volumes is then presented. Finally, a comparison of measured and predicted void volumes is made with data collected at 2000 psia under completely different conditions. Agreement with the data is very good.

Ottawa U. (Canada).
FINAL REPORT ON CONTRACT AF 19(604)1201, COVERING WORK DONE UP TO DECEMBER 31, 1956, by K. J. Laidler. Mar 57, 26p. AFCRC-TR-57-292; AD-117 243.
Order from LC mi$2.70, ph$4.80 PB 135 192

Work has been carried out with a view to determining heats of adsorption of water vapour on various salts, and to follow the kinetics of the adsorption processes. The work has been done using a microcalorimeter of the Calvet type. Salts of suitable surface characteristics have been prepared, and their surface areas measured using a BET apparatus. Some measurements of heats of wetting have been made. The heats evolved in adsorption are found to be of two types; the first is the heat of forming the monolayer, the second a residual heat due to penetration of water into the crystal. The monolayer heat was found to be proportional to the quantity of salt used.

Polytechnic Inst. of Brooklyn, N. Y.
THERMAL BUCKLING OF CIRCULAR CYLINDRICAL

AND CONICAL THIN-WALLED SHELLS, by David Abir, N. J. Hoff and others. Rept. on Contract AF 33(616)3885. Apr 58, 169p. 2 refs. WADC Technical rept. 58-104; AD-151 068.
Order from OTS $3.00 PB 151 740

The experiments made use of a 20 KW induction heating generator for the simulation of the effects of aerodynamic heating on the test specimens. In presenting the results, the present work is divided into six sections. The first three sections are confined to the investigation of the thermal buckling of circular cylindrical shells, covering respectively temperature and thermal stress distribution, buckling stress criterion, and experimental results. The remaining three sections parallel the format of the first three sections, but they deal with the investigations on circular conical thin-walled shells.

Stanford U., Calif.
PIN-FIN HEAT EXCHANGER SURFACES, by W. M. Kays. Technical rept. no. 19 on Contract no. N6onr-251(06). 30 Aug 53, 56p. 13 refs. AD-17 874.
Order from LC mi$3.60, ph$9.30 PB 139 925

A summary is given of heat-transfer and flow-friction data for plate-fin surfaces in which the fins are small-diameter, circular pins. New data are given, and problems of vibration and laminar flow in in-line pin configurations are discussed. A staggered-pin arrangement seemed desirable for alleviating these problems. A design study indicated that despite high friction factors, heat exchangers with pin-fin surfaces would be more compact than comparable plate-fin surfaces in which the fins are continuous or louvered sheets.

Wave Propagation

Aeronautical Research Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
MAGNETO-IONIC CALCULATIONS, by Clarence Ross and Carl S. Fluke. June 53, 347p. WADC Technical rept. 53-96; AD-18 112.
Order from LC mi$11.10, ph$53.10 PB 135 899

This report gives the results of extensive numerical calculations of the index of refraction, the absorption index, and the complex polarization vector for radio waves of low frequencies being propagate in an absorbing ionized medium in the presence of an external magnetic field. All of the calculations reported here were performed on OARAC, a new large scale digital computer operated for WADC at Wright-Patterson AFB, Ohio. The results are presented in tabular form. Any interpolation in these tables must necessarily make use of divided differences because of unequal argument intervals.

Applied Mathematics and Statistics Lab., Stanford U., Calif.
BOUNDARY VALUE PROBLEMS FOR $\nabla^2 u + k^2 u = 0$, by Ivar Stakgold. Technical rept. no. 17 on Contract Nonr-225(11). 29 Jan 54, 20p. 7 refs. AD-27 347.
Order from LC mi$2.40, ph$3.30 PB 139 975

A solution of $u_{xx} + u_{yy} + k^2 u = 0$, with u or $\partial u/\partial n$ prescribed on a half-line, is obtained by a direct method which is believed to be equally applicable to the problem of a wedge with an arbitrary opening. The problem of diffraction by an infinite cone with a spherical tip is also considered for both point source and plane wave excitations. For a cone opening of $\theta_0 = \pi/2$, the problem reduces to the reflection from a plane with a hemispherical boss; the solution is in agreement with that of V. Twersky (J. Acoust. Soc. Amer. 22:539, 1950).

Brown U. Div. of Engineering, Providence, R. I.
SOME STUDIES OF THE TRANSMISSION OF HIGH FREQUENCY RADIO WAVES VIA THE IONOSPHERE AT OBLIQUE INCIDENCE, by Kenneth Davies. Scientific rept. no. 2 on Contract AF 19(604)2066. June 58, 61p. 14 refs. AFCRC-TN-58-229; AD-152 463.
Order from LC mi$3.90, ph$10.80 PB 135 546

The present report deals with the anomalous reflection of high frequency radio waves from the ionosphere at frequencies near the maximum observed frequency. This anomalous mode of propagation can extend the usable frequency spectrum by some ten to fifteen per cent beyond the value calculated on the basis of classical theory.

Brown U. Div. of Engineering, Providence, R. I.
WAVE PROPAGATION IN A CO-AXIAL SYSTEM, by V. Michael Papadopoulos. Scientific rept. 9 on Contract AF 19(604)1391. Mar 58, 29p. 6 refs. AFCRC TN-57-963; AD-133 783.
Order from LC mi$2.70, ph$4.80 PB 135 501

A solution is obtained for the problem of the propagation of electromagnetic waves in a semi-infinite flanged coaxial line with an infinite centre conductor, in terms of an infinite set of coefficients which are determined by an infinite set of linear equations.

Bureau of Ordnance, Navy Dept., Washington, D. C.
MEASUREMENT OF ATMOSPHERIC ABSORPTION IN THE INFRARED. 5 Apr 57, 27p. 13 refs. NAVORD rept. 4871.
Order from LC mi$2.70, ph$4.80 PB 138 111

As part of an extensive survey of the infrared radiation from the sky, a series of measurements have been made of atmospheric attenuation. The primary purpose of the present measurements was to demonstrate not noly the effect of attenuation, but also, the effect of the emission of the intervening path length. A second purpose was to demonstrate the type of attenuation to be obtained in two important windows of the atmosphere; namely, at the wavelengths 2.0 to 2.5 microns and 3.5 to 4.2 microns.

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
THE TRANSMISSION OF ELECTROMAGNETIC WAVES IN THE PRESENCE OF A CONDUCTING LAYER OF GAS, by G. S. S. Ludford. Rept. on Contract AF 49(638)154. Feb 59, 24p. 3 refs. Technical

note BN-160; AFOSR TN-59-159; AD-211 118.
Order from LC mi$2.70, ph$4.80 PB 139 852

Two related questions concerning the transmission of electromagnetic waves are considered: (i) the reflection and transmission of plane waves at a perfectly conducting layer of gas in an otherwise non-conducting atmosphere, when there is a uniform external magnetic field perpendicular to the layer present. (ii) the existence of plane surface waves for such a finite layer.

Institute of Mathematical Sciences, New York U., N. Y.
MULTIPLE SCATTERING IN ONE DIMENSION, by Jack Bazer. Rept. on Contract AF 19(604)3495. Jan 59, 70p. 13 refs. Research rept. no. EM-122; AFCRC-TN-58-592; AD-207 910.
Order from LC mi$3.90, ph$10.80 PB 140 045

A rigorous treatment is given of two basic types of one-dimensional problems in the theory of the multiple scattering of waves by distributions of point scatterers. The first problem concerns scattering by a single configuration of scatterers with fixed but arbitrary positions in the (finite) scattering interval. The second problem concerns scattering from an ensemble of configurations, the ensemble arising out of the assumption that the scatterer positions are random variables.

Institute of Mathematical Sciences, New York U., N. Y.
VERTEX EXCITED SURFACE WAVES ON ONE FACE OF A RIGHT ANGLED WEDGE, by S. N. Karp and F. C. Karal, Jr. Rept. on Contract AF 19(604)1717. Jan 59, 19p. 7 refs. Research rept. no. EM-124; AFCRC-TN-59-131; AD-210 494.
Order from LC mi$2.40, ph$3.30 PB 140 044

The problem of the propagation of electromagnetic waves by a magnetic line dipole source located at the corner of a right angled wedge is considered. It is assumed that an impedance or mixed boundary condition is prescribed on one of the wedge surfaces and that a homogeneous boundary condition is prescribed on the other. A comparison is made between the magnitude of the surface wave for this problem and that of a magnetic-line dipole source located at the corner of a right angled wedge with the same impedance boundary condition prescribed on both surfaces. The far field amplitude of the radiated electromagnetic field is also given as an elementary function of the angle of observation.

Ionosphere Research Lab., Pennsylvania State U., University Park.
DIGITAL COMPUTER DETERMINATION OF LOW FREQUENCY POLARIZATION, by A. J. Ferraro. Scientific rept. no. 114 on Ionospheric Research, Contract AF 19(604)4563. 31 Dec 58, 43p. 10 refs. AFCRC-TN-59-221; AD-210 487.
Order from LC mi$3.30, ph$7.80 PB 140 144

In a previous report (Becker 1951, 1958), a rapid method (single discontinuity method) was discussed for determining the polarization of low frequency echoes which included the effects of collisions and the Earth's magnetic field. In the present report, the results of the rapid method are compared with those of the multislab approximation, and it is shown that the method yields satisfactory results. For two electron density profiles (one near critical coupling and one far removed) the Rydbeck coupling region was subdivided into slabs of uniform media; by matching the fields between adjacent slabs, N-1 simultaneous equations (for N slabs) were obtained.

Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
AVAILABLE SOURCE INFORMATION IN RECEIVING APERTURES, by E. R. Hiller, Jr. Thesis. Technical rept. no. 3 on Studies of Basic Missile Guidance and Radar Problems, Contract NOrd-14362. 1 Sep 56, 111p. 24 refs. AD-127 512.
Order from LC mi$6.00, ph$18.30 PB 134 350

The principles of statistical estimation theory are applied to the problem of estimating parameters of sources of electromagnetic radiation. Information for the estimation is obtained by observing field quantities within the bounds of a space aperture and for a limited time. The presence of noise limits the theoretical accuracy that is possible if optimum use is made of all of the information available. Since estimation of directional location of the source, or angle-of-arrival is particularly dependent on the size of the available aperture, this investigation is primarily concerned with this parameter and the manner in which the aperture limits the accuracy of its estimation.

Microwave Physics Lab., Sylvania Electric Products, Inc., Mountain View, Calif.
INVESTIGATION OF SUBMILLIMETER WAVE GENERATION, by E. N. Skomal. Scientific rept. no. 3, 1 Dec 58-28 Feb 59, on Contract AF 19(604)4081. 1 Mar 59, 6p. AFCRC-TN-59-142; AD-211 806.
Order from LC mi$1.80, ph$1.80 PB 139 898

The necessary equipment and materials have been procured to undertake a study of the microwave second harmonic generation process in yttrium iron garnet. Spherical single crystal specimens of yttrium garnet have been selected for this study primarily because the uniform precessional line width of such specimens is a sensitive function of surface finish. Most of the microwave equipment necessary for the study has been constructed.

Naval Research Lab., Washington, D. C.
ATTENUATION OF ELECTROMAGNETIC RADIATION BY SEA WATER, by E. Ornstein. 1 Apr 59, 9p. 30 refs. NRL rept. 5280.
Order from LC mi$1.80, ph$1.80 PB 138 310

Measured values of attenuation of electromagnetic radiation by sea water have been gathered from the literature. The measurements covering the frequency range 10^3 to 10^{21} cycles per second, have been converted to a uniform attenuation scale (decibels per yard) and plotted. In general, the picture is one of attenuation rising with frequency through the communications, microwave, and infrared

regions. The rise is ended by the visual-frequency "hole," and high values recur in the ultraviolet region of the spectrum. The limited data available indicate a gradual decline in attenuation from ultraviolet through the x-ray and gamma-ray regions.

Naval Research Lab., Washington, D. C.
WAVE PROPAGATION IN SUSPENSIONS, by W. S. Ament. 9 Apr 59, 122p. 32 refs. NRL rept. 5307.
Order from LC mi$6.30, ph$19.80 PB 138 844

The theoretical methods for determining the effective physical properties of suspensions or statistical mixtures of spherical particles of different isotropic materials are discussed. The methods are shown sufficiently general to allow estimates of secondary physical effects such as the average optical rotatory power, the thermoelectric power, and the acoustic attenuation of appropriate suspensions. When particles have sizes comparable with wavelength, the attempted average-property estimates are less satisfactory, and no attempt is made to obtain average-property estimates for anisotropic geometries or particle-materials. Addition formulas and other useful relations among spherical scalar and vector wave functions are derived for these applications.

Raytheon Mfg. Co., Waltham, Mass.
IONOSPHERE PROPAGATION STUDIES. Scientific rept. no. 2-5, 15 Mar-15 Sep 58, on Contract AF 19(604)2246. 15 Oct 58, 93p. 11 refs.
AFCRC-TN-58-388; AD-160 842.
Order from LC mi$5.40, ph$15.30 PB 139 917

Measurements at South Dartmouth, Mass. of the amplitude variations of a CW signal transmitted from Greencastle, Ind. have continued throughout the period. The data presented in this report completes two years of measurements over the ionosphere scatter path. A comparison of the average signal levels for the second year of measurement shows remarkable similarity with levels measured during the first year. Measurements of ionosphere scatter signals made at Grand Bahama Island have been of little value up to this time. Some samples of the data are shown in this report; however, for the most part, the signal to noise ratio at Grand Bahama Island is too low to permit any definite conclusions to be reached. During the months of Aug and Sep, a series of experimental tests were conducted between Greencastle and South Dartmouth to describe the variations in field strength of signals at and near the skip distance. The amplitude variations of the signal were recorded through the skip zone to a point where the signal fell to an amplitude about 30 db below normal mode levels.

Rome Air Development Center, Griffiss AFB, N. Y.
TROPOSPHERIC SCATTER DEVELOPMENTS, by Charles L. Mackey. Mar 59, 17p. 4 refs.
RADC-TN-59-17; AD-209 069.
Order from LC mi$2.40, ph$3.30 PB 140 020

This report is a review of developments made in the field of tropospheric scatter. High power klystron amplifier tubes, types of diversity and advantages, solid state devices, developments of lightweight miniaturization techniques for mobile application, and antenna applications are discussed.

Smyth Research Associates, San Diego, Calif.
RESEARCH ON THE EFFECT OF SURFACE CURVATURE ON THE SCATTERING PATTERN OF ARBITRARY OBJECTS, by L. R. Hughes and H. R. Ahrens. Final rept. on Contract Nonr-2126(00). Sep 57, 44p. 39 refs. SRA-44.
Order from LC mi$3.30, ph$7.80 PB 136 069

If full advantage is to be made of a radar's detection capabilities, a complete description of not only the general level, but of all those characteristics of the sea surface backscatter that may provide a means of differentiating the clutter from the target echo, must be known. Toward such a description of the scattering characteristics of the sea surface, the work reported here is aimed.

Stanford Research Institute, Menlo Park, Calif.
ELECTROMAGNETIC WAVE PROPAGATION IN A MEDIUM WITH VARIABLE DIELECTRIC CONSTANT $1+Kr^{-1}$, by Carson Flammer. Technical rept. 63 on Contract AF 19(604)1296. Jan 58 [36]p. 63 refs.
AFCRC-TN-57-584; AD-133 624.
Order from LC mi$3.00, ph$6.30 PB 135 211

The problem of this report is the calculation of the electromagnetic field in a region with dielectric constant of the form $1+Kr^{-1}$, when there is a source at an infinitely remote point. It is shown that when a certain simplifying assumption is made, a rather cumbersome closed-form solution is obtained. The asymptotic development of this solution, however, is comparatively simple. It consists of an incident distorted plane wave and a scattered wave. The diffraction of the incident wave is evidenced most clearly by the nature of the solution in the forward direction.

Texas A. and M. Coll., College Station.
INVESTIGATION OF THE ATMOSPHERIC PHYSICAL CONDITIONS ASSOCIATED WITH MICROWAVE PROPAGATION, by Lowell P. Riggs and Myron G. H. Ligda. Technical note no. 4 on Study of Synoptic Application of Weather Radar Data. Contract AF 19(604)1564. Mar 58, 73p. 20 refs.
Order from LC mi$4.50, ph$12.30 PB 135 589

In an attempt to evolve procedures whereby meteorologists, using ordinary weather observations, can predict anomalous propagation of radar energy, relationships between radar observations and weather factors which might reasonably be expected to influence "trapping" have been examined.

RESEARCH METHODS, TECHNIQUES AND EQUIPMENT

Ballistic Research Labs., Aberdeen Proving Ground, Md.
SPECTROGRAPH WITH SPACE-TIME RESOLUTION

AND ITS APPLICATION TO THE STUDY OF EXPLODING TUNGSTEN WIRE, by George E. Hauver. July 55, 12p. 3 refs. Memo. rept. no. 913.
Order from LC mi$2.40, ph$3.30 PB 139 931

A high-speed framing camera has been adapted for spectrographic studies. With this instrument it is possible to study simultaneously spectral characteristics as a function of both time and position in object space. Time-space resolved spectrograms of exploding tungsten wire were obtained, and the results are included in this report.

Naval Ordnance Lab., Corona, Calif.
FOUNDATIONAL RESEARCH PROJECTS. Quarterly rept. for July-Sep 57. 9 Dec 57, 53p. 12 refs. NOLC rept. 388; NAVORD rept. 4634.
Order from LC mi$3.60, ph$9.30 PB 140 245

Contents:
Ferroelectric phenomena
Ferromagnetic resonance
High-temperature polymer program
Infrared atomic spectra
Physics of semiconductor films
Radiation analysis
Small antenna study

SOCIAL SCIENCES

Stanford U., Calif.
NOTE ON THE STABILITY OF EQUILIBRIUM, by Hirofumi Uzawa. Technical rept. no. 44 on Contract N6onr-251(33). June 57, 13p. 6 refs. AD-134 947.
Order from LC mi$2.40, ph$3.30 PB 135 446

MISCELLANEOUS

Naval Research Lab., Washington, D. C.
REPORT OF NRL PROGRESS. June 59.
Order from OTS $1.25, $10.00/year PB 151 339

Contents:
Articles:
Fire-extinguishing sprinkler system for use at polar temperatures, by J. K. Musick and J. A. Grand
High-temperature exploding wire experiments, by V. E. Scherrer, J. M. Vitkovitsky, C. B. Dobbie, and R. C. O'Rourke
Electron diffraction by molecular vapors, by I. L. Karle and J. Karle
Scientific Program:
Astronomy and Astrophysics: Environmental factors affecting constant-volume balloon performance and control during meteorological-data-gathering flights
Chemistry: Wetting of low-energy solids by aqueous solutions of highly fluorinated acids and salts. Tautomerism in phosphorus chemistry: iodination of di-n-butyl phosphonate in n-butyl alcohol. Electrochemical mechanisms of noble-metal/hydrogen systems: transport of hydrogen and deuterium through metals. A new method for determining the degree of compatibility of dry chemical powders with fire-extinguishing, mechanical foams
Mechanics: Metal foil gages measure 95%-96% of strain on plastic model material. Gas turbine applications of pressure-gain and constant-pressure burners
Metallurgy and Ceramics: Tungsten-graphite thermocouple measures temperature of titanium during casting. Effect of atmosphere on the creep-rupture properties of powder metallurgy. Intermittent pile irradiation of a magnetic ferrite. Brillouin zone studies of ternary magnesium alloys. The aluminum-silicon eutetic
Radio: Performance of lightweight radio equipment during flights of the balloon-borne meteorological data-gathering system (Transosonde)
Solid-State Physics: Luminescence degradation in organic solids. Thermoluminescent dosimeter. Efficiency of a thermomagnetic generator
Supporting Techniques: Thin film measurements with a toolmaker's microscope
NRL Bibliographies

ATOMIC ENERGY COMMISSION REPORTS

Reports may be purchased in accordance with instructions on the inside front cover of the U. S. GOVERNMENT RESEARCH REPORTS. As PB numbers are not indicated, order by series and number. These reports may also be consulted at any AEC Depository Library. A list of these libraries may be obtained from the U. S. Department of Commerce, Office of Technical Services, Washington 25, D. C.

Reproduction in whole or part of any report listed herein is encouraged by the U. S. Atomic Energy Commission, subject to the approval of authors or originating sites. General inquiries from the industrial press about AEC-developed information should be directed to the Industrial Information Branch, Atomic Energy Commission, Washington 25, D. C.

General

Symposia in fields related to atomic energy. A literature search compiled by, Theodore F. Davis and Raymond L. Scott. Technical Information Service Extension. Oak Ridge, Tenn. Feb 1959. 20p. Order from OTS. 50 cents. TID-3526

Non-military uses of nuclear explosions, by H. Brown and G. W. Johnson. Univ. of California. Radiation Lab., Livermore, Calif. Jun 1958. Contract W-7405-eng-48. 16p. Order from OTS. 50 cents. UCRL-5206

Large scale excavation with nuclear explosives, by Clifford M. Bacigalupi. Univ. of California. Lawrence Radiation Lab., Livermore, Calif. Jan 1959. Contract W-7405-eng-48. 16p. Order from OTS. 50 cents. UCRL-5457

Biology and Medicine

Radium and mesothorium poisoning and dosimetry and instrumentation techniques in applied radioactivity. Annual progress report, by Robley D. Evans. Massachusetts Inst. of Technology. Radioactivity Center, Dept. of Physics, Cambridge, Mass. May 1958. Contract AT(30-1)-952. 188p. Order from OTS. $3.00. AECU-3774

Studies on the effects of maternally administered phosphorus-32 on foetal and post-natal development of the rat. Final technical report, by James E. Lofstrom. Wayne State Univ. Coll. of Medicine, Detroit, Mich. 1957. Contract AT-(11-1)-412. 57p. Order from LC. Mi $3.60, ph $9.30. AECU-3891

The effect of the level of nutrition on the pathology and productivity of range sheep. Progress report no. 4 and final report for January 15, 1957 to April 15, 1958. Utah State Agricultural Coll. Logan, Utah. 1958. Project 423. Contract AT(11-1)-207. 43p. Order from LC. Mi $3.30, ph $7.80. AECU-3893

The release and stability of the large subunit of DNA from T_2 and T_4 bacteriophage, by Charles A. Thomas, Jr. Johns Hopkins Univ. Baltimore, Md. 1958. Contract AT(30-1)-2119. 47p. Order from LC. Mi $3.30, ph $7.80. AECU-3894

The effect of X-irradiation on a megakaryocytosis produced in gelatin treated animals. Progress report, by Irwin M. Murray and Arlene R. Seaman. State Univ. of New York. Veterinary Coll. Ithaca, N. Y. 1945. Contract AT(30-1)-2080. 5p. Order from LC. Mi $1.80, ph $1.80. AECU-3897

Antibody synthesis, by William H. Taliaferro. Univ. of Chicago. Chicago, Ill. 1958. Contract AT(11-1)-175. 32p. Order from LC. Mi $3.00, ph $6.30. AECU-3912

Bibliography on space medicine, by Ruth M. Hendrickson, comp. Los Alamos Scientific Lab. Los Alamos, N. Mex. Mar 1958. Contract W-7405-eng-36. (D-BIB-21). 47p. Order from LC. Mi $3.30, ph $7.80. AECU-3914

Semiannual report to the Atomic Energy Commission, by Leon O. Jacobson, M.D. Univ. of Chicago. Argonne Cancer Research Hospital, Chicago, Ill. Sep 1958. Contract AT-(11-1)-69. 115p. Order from OTS. $2.50. ACRH-10

Evidence for normal adrenocortical function in two patients subjected to prolonged sodium restriction, by Lewis K. Dahl and others. Brookhaven National Lab. Upton, N. Y. Jan 1958. 25p. Order from LC. Mi $2.70, ph $4.80. BNL-3565

Chemical toxicity of plutonium in yeast, by W. J. Bair and F. P. Hungate. General Electric Co. Hanford Atomic Products Operation, Richland, Wash. Dec 1958. Contract W-31-109-Eng-52. 13p. Order from OTS. 50 cents. HW-58334

The separation and characterization as regards radiation sensitivity of the proteins of lymphoid tissue. Final technical report for period July 1, 1952-September 30, 1958, by Eugene L. Hess. Worcester Foundation for Experimental Biology. Shrewsbury, Mass. Oct 1958. Contract AT (30-1)-2084. 13p. Order from LC. Mi $2.40, ph $3.30. NYO-2426

Recovery of induced micromutations in oats and rye by recurrent selection, by A. T. Wallace and Fred H. Hull. Univ. of Florida. Agricultural Experiment Station, Gainesville, Fla. 1956. 13p. Order from LC. Mi $2.40, ph $3.30. ORO-178

Effect of densely ionizing radiations on dry preparations of lysozyme, trypsin, and DNase, by Tor Brustad. Univ. of California. Radiation Lab., Berkeley, Calif. Aug 1958. Contract W-7405-eng-48. 13p. Order from LC. Mi $2.40, ph $3.30. UCRL-8237

Energy reception and transfer in photosynthesis, by Melvin Calvin. Univ. of California. Radiation Lab., Berkeley, Calif. Sep 1958. Contract W-7405-eng-48. 37p. Order from LC. Mi $3.00, ph $6.30. UCRL-8524

A study of the effects of elevated temperatures on the growth and inheritance of saccharomyces cerevisiae (thesis), by Freddie Sherman. Univ. of California. Lawrence Radiation Lab., Berkeley, Calif. Nov 1958. Contract W-7405-eng-48. 70p. Order from OTS. $1.75. UCRL-8573

Studies on sub-fabric burns: the relationship of surface appearance and depth of damage; a method of study, preliminary results, and observations of wound healing, by Kelly M. Berkley. Univ. of Rochester. Atomic Energy Project, Rochester, N. Y. Feb 1959. Contract W-7401-eng-49. 11p. Order from OTS. 50 cents. UR-538

Studies on large area sub-fabric burns: the effect of an air space between a two layer system, by Kelly M. Berkley. Univ. of Rochester. Atomic Energy Project, Rochester, N. Y. Mar 1959. Contract W-7401-eng-49. 18p. Order from OTS. 75 cents. UR-539

Chemistry—General

A calculation of the elastic constants of calcium fluoride (thesis). Technical report no. 1, by Robert N. Seitz. Case Inst. of Tech. Cleveland, Ohio. May 1958. Contract AT(11-1)-623. 36p. Order from LC. Mi $3.00, ph $6.30. AECU-3875

Design of a once-through rubidium boiler, by Stephen F. D'Urso and Victor C. Vaughen. For Union Carbide Nuclear Co. K-25 plant. Massachusetts Inst. of Tech. Engineering Practice School, Oak Ridge, Tenn. Nov 1956. Contract W-7405-eng-26, subcontract 70. (KT-245). 16p. Order from LC. Mi $2.40, ph $3.30. AECU-3896

Progress report for September 1958. Technical report no. 5. Anderson Physical Lab. Champaign, Ill. 1958. Contract AT(11-1)-544. 14p. Order from LC. Mi $2.40, ph $3.30. AECU-3899

Alpha ferric oxide: low temperature heat capacity and thermodynamic functions, by Fredric Gronvold and Edgar F. Westrum, Jr. Univ. of Michigan. Ann Arbor, Mich. 1957. 16p. Order from LC. Mi $2.40, ph $3.30. AECU-3919

Kinetics of formation and isotope exchange reactions involving the chlorine fluorides. I. Kinetics of the formation of chlorine monofluoride from chlorine and chlorine trifluoride. II. Kinetics of the exchange of chlorine between chlorine monofluoride and chlorine trifluoride. III. Kinetics of the exchange of chlorine between chlorine monofluoride and chlorine, by Max T. Rogers and others. Michigan State Univ. East Lansing, Mich. Mar 1956. Contract AT-(11-1)-151. (M-5881). 159p. Order from LC. Mi $7.50, ph $24.30. AECU-3928

Visual observation of liquid-liquid spray column performance, by M. H. Fontana and R. W. Wolff. For Oak Ridge Gaseous Diffusion Plant. Massachusetts Inst. of Tech. Engineering Practice School, Oak Ridge, Tenn. Nov 1956. Contract W-7405-eng-26, subcontract 70. (KT-250). 32p. Order from LC. Mi $3.00, ph $6.30. AECU-3939

The effect of ion pairing on the kinetics of exchange of p-nitrobenzyl bromide with radiobromide in liquid SO_2, by K. N. Rao and N. N. Lichtin. Brookhaven National Lab. Upton, N. Y. 1958. 4p. Order from LC. Mi $1.80, ph $1.80. BNL-3881

HRP-preliminary studies of the fluidized bed denitration of thorium nitrate, by Harvey L. List. Oak Ridge National Lab. Oak Ridge, Tenn. Sep 1958. Contract W-7405-eng-26. 24p. Order from LC. Mi $2.70, ph $4.80. CF-58-9-35

Dowtherm "A" journal bearing test, by W. E. Thomas. Oak Ridge National Lab. Oak Ridge, Tenn. Nov 1958. Contract W-7405-eng-26. 18p. Order from LC. Mi $2.40, ph $3.30. CF-58-10-40

Explosive reactions during reprocessing of reactor fuels containing uranium and zirconium or niobium, by T. A. Gens. Oak Ridge National Lab. Oak Ridge, Tenn. Nov 1958. Contract W-7405-eng-26. 11p. Order from LC. Mi $2.40, ph $3.30. CF-58-11-31

Results of examinations of fused salt mixtures by optical and X-ray diffraction methods, by R. E. Thomas. Oak Ridge National Lab. Oak Ridge, Tenn. Nov 1958. Contract W-7405-eng-26. 54p. Order from LC. Mi $3.60, ph $9.30. CF-58-11-40

Analysis for Np^{237} in nitric acid solutions, by Bruce B. Murray. E. I. du Pont de Nemours & Co. Explosives Dept. - Atomic Energy Div., Technical Div. - Savannah River Lab., Savannah, Ga. Sep 1958. Contract AT(07-2)-1. 14p. Order from OTS. 50 cents. DP-316

Ion exchange - spectrographic determination of arsenic and phosphorus in river water, by R. Ko. General Electric Co. Hanford Atomic Products Operation, Richland, Wash. Jan 1958. Contract W-31-109-Eng-52. 13p. Order from OTS. 50 cents. HW-59008

Prediction of continuous extractor performance from simulated extraction column data, by Morton Smutz. Ames Lab. Ames Iowa. Sep 1957. Contract W-7405-eng-82. 8p. Order from LC. Mi $1.80, ph $1.80. ISC-900

Annotated bibliography of α-benzildioxime, by Charles V. Banks and others. Iowa State College. Ames Lab., Ames, Iowa. Jun 1958. Contract W-7405-eng-82. 60p. Order from OTS. $1.75. ISC-1038

Decontamination of the KAPL 120 loop by alkaline permanganate-acid treatments, by F. C. Steiner. Knolls Atomic Power Lab. Schenectady, N. Y. Nov 1958. Contract W-31-109-Eng-52. 66p. Order from LC. Mi $3.90, ph $10.80. KAPL-M-SMS-95

Compressibility factors and fugacity coefficients calculated from the Beattie-Bridgeman equation of state for hydrogen, nitrogen, oxygen, carbon dioxide, ammonia, methane, and helium, by C. E. Holley, Jr. and others. Univ. of California. Los Alamos Scientific Lab., Los Alamos, N. Mex. Aug 1958. Contract W-7405-ENG-36. 49p. Order from OTS. $1.50. LA-2271

Determination of chloride in uranium-bearing materials by a potentiometric titration method, by Paul G. Laux and Ernest A. Brown. National Lead Company of Ohio. Cincinnati, Ohio. Nov 1958. Contract AT(30-1)-1156. 39p. Order from OTS. $1.50. NLCO-751

Electrochemistry of molten salts. Period covered: June 1, 1954 to June 1, 1956, by Earl H. Roland and G. M. Pound. Carnegie Inst. of Tech. Metals Research Lab., Pittsburgh, Pa. Jun 1956. Contract AT(30-1)-1432. 122p. Order from LC. Mi $6.30, ph $19.80. NYO-6013

A thermodynamic study of some complexes of metal ions with polyamines, by Charles R. Bertsch and others. Pennsylvania State Univ. Coll. of Chemistry and Physics, University Park, Pa. Apr 1956. Contract AT(30-1)-907. 20p. Order from LC. Mi $2.40, ph $3.30. NYO-6591

Enthalpies and heat capacities of solid and molten fluoride mixtures, by W. D. Powers and G. C. Blalock. Oak Ridge National Lab. Oak Ridge, Tenn. Feb 1956. Decl. with deletions Nov 1958. Contract W-7405-eng-26. 31p. Order from LC. Mi $3.00, ph $6.30. ORNL-1956(Del.)

Viscosity measurements on molten fluoride mixtures, by S. I. Cohen and T. N. Jones. Oak Ridge National Lab. Oak Ridge, Tenn. Jul 1957. Decl. with deletions Nov 1958. Contract W-7405-eng-26. 50p. Order from LC. Mi $3.30, ph $7.80. ORNL-2278(Del.)

Determination of lithium carbonate in lithium carbonate in lithium hydride, by Jack W. Frazer and Carl W. Schoenfelder. Univ. of California. Radiation Lab., Livermore Site, Livermore, Calif. Mar 1957. Contract W-7405-eng-48. 8p. Order from OTS. 50 cents. UCRL-4918

The determination of uranium in aluminum-uranium alloys: application of polarized electrode end-point indication, by W. J. Sewalk and G. W. Goward. Westinghouse Electric Corp. Bettis Plant, Bettis Atomic Power Div., Pittsburgh, Pa. Dec 1958. Contract AT-11-1-GEN-14. 11p. Order from OTS. 50 cents. WAPD-209

Chemistry—Radiation and Radiochemistry

Chemical feasibility of homogeneous neutron poisons for criticality control in fuel reprocessing, by J. G. Moore and R. H. Rainey. Oak Ridge National Lab. Oak Ridge, Tenn. Dec 1958. Contract W-7405-eng-26. 8p. Order from LC. Mi $1.80, ph $1.80. CF-58-12-23

Trans-plutonium isotope buildup by neutron irradiation of plutonium, by F. P. Brauer and Helen H. Burley. General Electric Co. Hanford Atomic Products Operation, Richland, Wash. Dec 1958. Contract W-31-109-Eng-52. 46p. Order from OTS. $1.25. HW-58596

Chemical effects of neutron capture in some cobaltic hexamines (thesis), by Arvid V. Zuber. Brookhaven National Lab. Upton, N. Y. and Columbia Univ. New York, N. Y. Jun 1954. Contract AT(30-1)-1019. (CU-18-54-AEC-1019-Chem). 75p. Order from LC. Mi $4.50, ph $12.30. NYO-6142

Chemistry—Separation Processes for Plutonium and Uranium

The extraction of uranium from phosphate solutions, by H. R. Baxman. Los Alamos Scientific Lab. Los Alamos, N. Mex. 1956? Decl. May 1956. Contract W-7405-eng-36. 9p. Order from LC. Mi $1.80, ph $1.80. AECD-3746

Pilot Plant Radioactive Gas Separation Process equipment and operating instructions, by W. B. Watkins and others. Oak Ridge National Lab. Oak Ridge, Tenn. Nov 1952. Decl. with deletions Nov 1958. Contract W-7405-eng-26. 45p. Order from LC. Mi $3.30, ph $7.80. CF-52-11-82(Del.)

Darex flowsheet (batch operations), by Walter E. Clark. Oak Ridge National Lab. Oak Ridge, Tenn. Sep 1957. Decl. Nov 1958. Contract W-7405-eng-26. 18p. Order from LC. Mi $2.40, ph $3.30. CF-57-9-73

Development of batchwise and semi-continuous Darex flowsheets using 61 wt per cent $NH0_3$, by F. G. Kitts and B. C. Finney. Oak Ridge National Lab. Oak Ridge, Tenn. Nov 1958. Contract W-7405-eng-26. 8p. Order from LC. Mi $1.80, ph $1.80. CF-58-11-106

Homogeneous reactor fuel reprocessing. Quarterly progress report for January 1-March 31, 1957. Vitro job 1087, by Robert A. Keeler and others. For Oak Ridge National Lab. Vitro Labs. West Orange, N. J. Apr 1957. Decl. Jan 1959. Contract W-7405-eng-26, subcontract no. 535. 31p. Order from LC. Mi $2.70, ph $4.80. KLX-10067

The processing-refabrication experiment (PRE) for irradiated UO_2, by D. I. Sinizer and others. Atomics International Div. North American Aviation, Inc. Canoga Park, Calif. 1958. Contract AT-11-1-GEN-8. 67p. Order from LC. Mi $4.50, ph $12.30. NAA-SR-2778

Laboratory development of the thorex process progress report, December 1, 1955, to January 1, 1958, by R. H. Rainey and others. Oak Ridge National Lab. Oak Ridge, Tenn. N.D. Contract W-7405-eng-26. 53p. Order from OTS. $1.50. ORNL-2591

Controlled Thermonuclear Processes

Magnetic field distributions in a pinched discharge, by L. C. Burkhardt and others. Los Alamos Scientific Lab. Los Alamos, N. Mex. Nov 1955. Decl. Jan 1959. Contract W-7405-ENG-36. 25p. Order from LC. Mi $2.70, ph $4.80. LA-2131

Stability of a linear pinch with a thick boundary, by B. R. Suydan. Los Alamos Scientific Lab. Los Alamos, N. Mex. Aug 1957. Decl. Jan 1959. Contract W-7405-ENG-36. 16p. Order from LC. Mi $2.40, ph $3.30. LA-2149

On the ionization and heating of plasma, by Lyman Spitzer, Jr. and Louis Witten. Princeton Univ. Project Matterhorn, Princeton, N. J. Mar 1953. Decl. Aug 1958. Contract AT(30-1)-1238. (PM-S-6). 47p. Order from LC. Mi $3.30, ph $7.80. NYO-999

On the pulse method of ionization and heating of a plasma, by J. M. Berger and E. A. Frieman. Princeton Univ. Project Matterhorn, Princeton, N. J. Oct 1953. Decl. Aug 1958. Contract AT(30-1)-1238. (PM-S-10). 37p. Order from LC. Mi $3.00, ph $6.30. NYO-6043

Heating of a plasma by magnetic pumping, by Jay M. Berger. Princeton Univ. Project Matterhorn, Princeton, N. J. May 1954. Decl. Oct 1958. Contract AT(30-1)-1238. (PM-S-13). 40p. Order from LC. Mi $3.00, ph $6.30. NYO-6046

The influence of end mirrors, high density and long tube length on radial diffusion, by Albert Simon. Oak Ridge National Lab. Oak Ridge, Tenn. Sep 1955. Decl. Nov 1958. Contract W-7405-eng-26. 17p. Order from LC. Mi $2.40, ph $3.30. ORNL-1960

Ionization and dissociation of energetic ions by a carbon discharge-status report, by John S. Luce. Oak Ridge National Lab. Oak Ridge, Tenn. Jan 1957. Decl. Nov 1958. Contract W-7405-eng-26. 24p. Order from LC. Mi $2.70, ph $4.80. ORNL-2219

Design and fabrication of solenoids for high magnetic fields, by Frederic Coensgen and others. Univ. of California. Radiation Lab., Livermore, Calif. Dec 1955. Decl. Dec 1958. Contract W-7405-eng-48. 51p. Order from LC. Mi $3.30, ph $7.80. UCRL-4544

ARC research. Note on table top injection: high energy injection inside the mirrors, by J. R. Hiskes. Univ. of California. Radiation Lab., Livermore, Calif. Aug 1955. Decl. Nov 1958. Contract W-7405-eng-48. 14p. Order from LC. Mi $2.40, ph $3.30. UCRL-4558

ARC research. Adiabatic injection, by William I. Linlor. Univ. of California. Radiation Lab., Livermore, Calif. Sep 1955. Decl. Nov 1958. 19p. Order from LC. Mi $2.40, ph $3.30. UCRL-4570

ARC research. Continuous injection processes, by William I. Linlor. Univ. of California. Radiarion Lab., Livermore, Calif. Sep 1955. Decl. Nov 1958. Contract W-7405-eng-48. 7p. Order from LC. Mi $1.80, ph $1.80. UCRL-4571

Liquid-sodium instability experiment. Part II, by Stirling A. Colgate. Univ. of California. Radiation Lab., Livermore, Calif. Sep 1955. Decl. Nov 1958. Contract W-7405-eng-48. 12p. Order from LC. Mi $2.40, ph $3.30. UCRL-4580

Production of large energetic neutral deuteron beams, by R. E. Hester. Univ. of California. Radiation Lab., Livermore, Calif. Jan 1956. Decl. Nov 1958. Contract W-7405-eng-48. 8p. Order from LC. Mi $1.80, ph $1.80. UCRL-4643

Production of a high energy neutral H or D beam, by Gordon Gibson and E. J. Lauer. Univ. of California. Radiation Lab., Livermore, Calif. Jan 1956. Decl. Nov 1958. 6p. Order from LC. Mi $1.80, ph $1.80. UCRL-4645

Some preliminary investigations in the use of a supersonic mercury vapor jet for providing an energetic neutral beam, by J. F. Steinhaus. Univ. of California. Radiation Lab., Livermore, Calif. Jul 1956. Decl. Nov 1958. 11p. Order from LC. Mi $2.40, ph $3.30. UCRL-4729

Cyclotron resonance heating of a deuterium plasma, by Edmund S. Chambers and others. Univ. of California. Radiation Lab., Livermore, Calif. Oct 1957. Decl. Jan 1959. Contract W-7405-eng-48. 28p. Order from LC. Mi $2.70, ph $4.80. UCRL-5015

Summary of UCRL pyrotron (mirror machine) program, by R. F. Post. Univ. of California. Radiation Lab., Livermore, Calif. Jun 1958, Contract W-7405-eng-48. 40p. Order from LC. Mi $3.00, ph $6.30. UCRL-5044

Large toroidal stabilized pinch proposal, by S. A. Colgate and P. H. Furth. Univ. of California. Radiation Lab., Livermore, Calif. Jan 1958. Decl. Sep 1958. Contract W-7405-eng-48. 21p. Order from LC. Mi $3.30, ph $7.80. UCRL-5109-T

Criticality Studies

Critical experiments with 2.09% U^{235} enriched uranium metal plates in water, by J. K. Fox and others. Oak Ridge National Lab. Oak Ridge, Tenn. Aug 1958. Contract W-7405-eng-26. 9p. Order from LC. Mi $1.80, ph $1.80. CF-58-8-3

Criticality considerations in the design of plants using U^{235}, by J. D. McLendon. Union Carbide Corp. Union Carbide Nuclear Co., Y-12 Plant, Oak Ridge, Tenn. Jan 1959. Contract W-7405-eng-26. 24p. Order from OTS. 75 cents. Y-1245

Geology and Mineralogy

Synthesis of calcium vanadate minerals and related compounds, by Richard Marvin. Geological Survey. Washington, D. C. Jun 1956. 27p. Order from LC. Mi $2.70, ph $4.80. TEI-616

Health and Safety

Upper atmosphere monitoring program. Quarterly report covering period February 1, 1958 thru June 30, 1958. Report no. 1884, by Sidney Stern and others. General Mills, Inc. Minneapolis, Minn. Nov 1958. Project no. 89125. Contract AT(11-1)-401. 51p. Order from LC. Mi $3.60, ph $9.30. AECU-3904

High-altitude sampling techniques. Progress report no. 5 for September 1958. Univ. of Chicago. Chicago Midway Labs., Chicago, Ill. 1958. Contract AT(11-1)-508. (CML-SR-M124-5). 13p. Order from LC. Mi $2.40, ph $3.30. CML-M124-5

Instruments

Differential voltammetry using the hanging mercury drop electrode, by Kenneth J. Martin and Irving Shain. Univ. of Wisconsin. Madison, Wisc. 1958. Project no. 17. Contract AT(11-1)-64. 12p. Order from LC. Mi $2.40, ph $3.30. AECU-3755

Proceedings of the large-crystal spectrometry symposium held in Cincinnati, Ohio May 23, 1958, by J. G. Carver. General Electric Co. Atomic Products Div., Aircraft Nuclear Propulsion Dept., Cincinnati, Ohio. Mar 1959. Contracts AF 33(600)-38062 and AT(11-1)-17. 74p. Order from OTS. $2.25. APEX-471

A two-dimensional kicksorter with magnetic drum storage, by Robert L. Chase. Brookhaven National Lab. Upton, N. Y. 1958. 16p. Order from LC. Mi $2.40, ph $3.30. BNL-3838

Four experimental resin coated condensers, by F. A. Koehler. Goodyear Atomic Corp. Portsmouth, Ohio. Oct 1958. Contract AT(33-2)-1. 4p. Order from LC. Mi $1.80, ph $1.80. GAT-T-544

Technical specifications for uranium colorimeters, by G. J. Alkire. General Electric Co. Hanford Atomic Products Operation, Richland, Wash. Dec 1956. Contract W-31-109-Eng-52. 6p. Order from LC. Mi $1.80, ph $1.80. HW-39823(Rev. 1)

A pulse reading method for condenser ion chambers, by W. C. Roesch and others. General Electric Co. Hanford Atomic Products Operation, Richland, Wash. 1957. Contract W-31-109-Eng-52. 15p. Order from LC. Mi $2.40, ph $3.30. HW-57266

PRTR process channel leak detection facility. Final report-Design test PR-63, by R. F. Scheloske. General Electric Co. Hanford Atomic Products Operation, Richland, Wash. Oct 1958. Contract W-31-109-Eng-52. 11p. Order from LC. Mi $1.80, ph $1.80. HW-57700

A sensitive ratio recorder for mass spectrometers, by W. G. Hart and A. Langdon. Union Carbide Corp. Union Carbide Nuclear Co., Oak Ridge Gaseous Diffusion Plant, Oak Ridge, Tenn. Mar 1959. Contract W-7405-eng-26. 7p. Order from OTS. 50 cents. K-1292

Nuclear battery powered timers, by R. L. DesJardin. Sandia Corp. Albuquerque, N. Mex. Sep 1958. Contract AT(29-1)-789. 19p. Order from LC. Mi $2.40, ph $3.30. SCTM-330-58(14)

Measurement of microwave peak power using the 'notch' measurement technique, by C. E. Morgan. Sandia Corp. Albuquerque, N. Mex. Oct 1958. Contract AT(29-1)-789. 10p. Order from LC. Mi $2.40, ph $3.30. SCTM-343-58(14)

Equipment and methods for automatic track analysis, by Walter H. Barkas. Univ. of California. Radiation Lab., Berkeley, Calif. Aug 1958. Contract W-7405-eng-48. 32p. Order from LC. Mi $3.00, ph $6.30. UCRL-8482

Metallurgy and Ceramics

Activities in liquid and solid metal systems. Progress report on research program for February 1, 1958 to January 31, 1959, by John F. Ellicott. Massachusetts Inst. of Tech. Dept. of Metallurgy, Cambridge, Mass. Oct 1958. Contract AT(30-1)-1888. 9p. Order from LC. Mi $1.80, ph $1.80. AECU-3864

Geometric dependence of magnetic anisotropy in thin iron films. Technical report no. 3, by Thomas G. Knorr and R. W. Hoffman. Sep 1958. Contract AT(11-1)-623. 69p. Order from LC. Mi $3.90, ph $10.80. AECU-3877

Reactions of metals with oxygen and steam. Quarterly report no. 5 (report no. 15) for July-September 1958, by Fred E. Littman and Franklin M. Church. For Oak Ridge National Lab. Stanford Research Inst. Menlo Park, Calif. Oct 1958. SRI project no. SD-2116. Contract 7405-eng-26, subcontract 1088. 7p. Order from LC. Mi $1.80, ph $1.80. AECU-3882

Corrosion resistance and mechanical properties of aluminum powder products, by J. E. Draley and W. E. Ruther. Argonne National Lab. Lemont, Ill. Mar 1959. Contract W-31-109-eng-38. 10p. Order from OTS. 50 cents.
ANL-5927

Alumina-clad UO_2 for fuel applications, by Allison K. Smalley and others. Battelle Memorial Inst. Columbus, Ohio. Feb 1959. Contract W-7405-eng-92. 8p. Order from OTS. 50 cents.
BMI-1321

High-temperature mechanical properties of tantalum, by David C. Drennen and others. Battelle Memorial Inst. Columbus, Ohio. Mar 1959. Contract W-7405-eng-92. 33p. Order from OTS. $1.00.
BMI-1326

Study of corrosion on various metals in the calcining of aqueous radioactive wastes containing zirconium fluoride and aluminum nitrate as bulk salts, by E. J. Tuthill and R. F. Domish. Brookhaven National Lab. Upton, N. Y. May 1958. 48p. Order from OTS. $1.50.
BNL-510(T-123)

Neutron diffraction investigation of a possible ferro-antiferromagnetic phase transition in Mn_2Cr_8Sb, by S. J. Pickart and R. Nathans. Brookhaven National Lab. Upton, N. Y. 1958. 3p. Order from LC. Mi $1.80, ph $1.80.
BNL-3825

HRE-2 corrosion specimens-blanket region of pressure vessel (loading no. 1)-weight data and scale analysis, by A. R. Olsen. Oak Ridge National Lab. Oak Ridge, Tenn. Oct 1958. Contract W-7405-eng-26. 13p. Order from LC. Mi $2.40, ph $3.30.
CF-58-10-83

HRP-performance of Continental Coatings, Inc. H_2-O_2 flame-spraying equipment for flame calcination of ThO_2, by C. C. Haws. Oak Ridge National Lab. Oak Ridge, Tenn. Nov 1958. Contract W-7405-eng-26. 10p. Order from LC. Mi $1.80, ph $1.80.
CF-58-11-70

70-ton shipping cask for the Savannah River Plant-design and fabrication, by William H. Piper and John W. Langhaar. E. I. du Pont de Nemours & Co. Engineering Dept. and Explosives Dept. -Atomic Energy Div., Technical Div. -Wilmington, Delaware. Jan 1959. Contract AT(07-2)-1. 71p. Order from OTS. $2.00.
DP-357

Uranium from ore to fuel elements, by R. E. Olson. General Electric Co. Hanford Atomic Products Operation, Richland, Wash. Apr 1958. Contract W-31-109-Eng-52. 32p. Order from LC. Mi $2.70, ph $4.80.
HW-55689

Bismuth slurries as reactor fuels, by H. T. Hahn. General Electric Co. Hanford Atomic Products Operation, Richland, Wash. Aug 1958. Contract W-31-109-Eng-52. 35p. Order from OTS. $1.00.
HW-57161

Clad splitting in defective zircaloy-2 clad uranium fuel rod, by G. T. Geering and D. C. Worlton. General Electric Co. Hanford Atomic Products Operation, Richland, Wash. Oct 1958. Contract W-31-109-Eng-52. 9p. Order from LC. Mi $1.80, ph $1.80.
HW-57814

List of high purity metals available from American Producers, by H. A. Wilhelm and R. E. McCarley. Iowa State Coll. Ames Lab., Ames, Iowa. Dec 1958. Contract W-7405-Eng-82. 55p. Order from OTS. $1.50.
ISC-1029

The development of composite control rods for water-cooled power reactors, by W. E. Ray. General Electric Co. Knolls Atomic Power Lab., Schenectady, N. Y. Oct 1957. Contract W-31-109-Eng-52. 33p. Order from OTS. $1.25.
KAPL-1915

Irradiation performance of highly enriched fuel, by C. E. Lacy and E. A. Leary. General Electric Co. Atomic Power Lab., Schenectady, N. Y. Jun 1958. Contract W-31-109-Eng-52. 24p. Order from LC. Mi $2.40, ph $3.30.
KAPL-1952

Mechanical properties of joints in oxide dispersion fuel elements brazed with 70 Mn-30 Ni alloy, by J. M. Gerken. Knolls Atomic Power Lab. Schenectady, N. Y. Sep 1956. Contract W-31-109-Eng-52. 16p. Order from LC. Mi $2.40, ph $3.30.
KAPL-M-JMG-4

The thermal conductivity of a molten Pu-Fe eutectic (9.5 a/o Fe), by John E. Deverall. Univ. of California. Los Alamos Scientific Lab., Los Alamos, N. Mex. Jul 1958. Contract W-7405-ENG-36. 59p. Order from OTS. $1.75.
LA-2269

Laboratory evaluation of graphite crucible coatings for vacuum melting uranium, by Orville R. Magoteaux and others. National Lead Company of Ohio. Cincinnati, Ohio. Oct 1958. Contract AT(30-1)-1156. 27p. Order from OTS. $1.25.
NLCO-759

Control of carbon pickup in uranium metal by induction furnace tuning, by J. W. Mahaffey. National Lead Company of Ohio. Cincinnati, Ohio. Jul 1958. Contract AT(30-1)-1156. 12p. Order from OTS. 50 cents. NLCO-768

Methods for fabrication and properties of porous uranium fuel elements, by I. Sheinhartz. Sylvania-Corning Nuclear Corp. Bayside, N. Y. May 1958. Contract AT-30-1-GEN-366. 23p. Order from LC. Mi $2.70, ph $4.80. SCNC-259

A study of standard clearance hole sizes, positional tolerances and drill size selection for steel and cast iron, by Clyde I. Millard. Sandia Corp. Albuquerque, N. Mex. Jan 1957. Contract AT(29-1)-789. (M-6106). 24p. Order from LC. Mi $2.70, ph $4.80. SCTM-133-56(16)

Aluminum alloys suitable for use in high temperature water. Report no. 2, by J. Belle. Westinghouse Electric Corp. Atomic Power Div., Pittsburgh, Pa. Oct 1955. 12p. Order from LC. Mi $2.40, ph $3.30. WAPD-PMM-79

Alternate control rod materials; silver-base alternate control rod alloys. Westinghouse Electric Corp. Bettis Plant, Pittsburgh, Pa. Apr 1958. 22p. Order from LC. Mi $2.70, ph $4.80. WAPD-PWR-PMM-1879

Hydrogen redistribution in zircaloy-2 under thermal and mechanical stress gradients, by J. M. Markowitz. Westinghouse Electric Corp. Bettis Plant, Pittsburgh, Pa. Jan 1959. Contract AT-11-1-GEN-14. 20p. Order from OTS. 75 cents. WAPD-TM-171

Particle Accelerators and High-Voltage Machines

Survey of the 25 Bev synchrotron at Brookhaven National Laboratory, by C. S. Reading. Brookhaven National Lab. Upton, N. Y. Jul 1958. 10p. Order from LC. Mi $1.80, ph $1.80. BNL-3797

The Oak Ridge relativistic isochronous cyclotron, by R. S. Livingston and F. T. Howard. Oak Ridge National Lab. Oak Ridge, Tenn. Sep 1958. Contract W-7405-eng-26. 130p. Order from OTS. $2.75. ORNL-2648

A high-current radio-frequency ion accelerator, by William A. S. Lamb and others. Univ. of California. Radiation Lab., Livermore, Calif. Feb 1957. Contract W-7405-eng-48. 18p. Order from LC. Mi $2.40, ph $3.30. UCRL-4815

Radiofrequency system for extracting particles from a cyclotron, by Warren Fenton Stubbins. Univ. of California. Lawrence Radiation Lab., Berkeley, Calif. Sep 1958. Contract W-7405-eng-48. 15p. Order from OTS. 50 cents. UCRL-8578

Physics and Mathematics

Properties of nuclear matter, by L. C. Gomes and others. Massachusetts Inst. of Tech. Lab. for Nuclear Science. Cambridge, Mass. and Rio de Janeiro. Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro, Brazil. Jan 1958. (Notas de Fisica, Vol. IV, No. 2). 59p. Order from LC. Mi $3.60, ph $9.30. AECU-3861

Interaction of neutrons with oxygen and a study of the $C^{13}(\ ,n)O^{16}$ reaction, by R. B. Walton and others. Univ. of Wisconsin. Madison, Wisc. 1956. Contract AT-11-1-GEN-7. (M-6185). 35p. Order from LC. Mi $3.30, ph $7.80. AECU-3871

The vector interaction in beta decay, by Jeremy Bernstein and Robert R. Lewis. Institute for Advanced Study. Princeton, N. J. 1958. 26p. Order from LC. Mi $2.70, ph $4.80. AECU-3878

Scattering studies with the Ohio State University cyclotron. Annual report for September 14, 1957-September 30, 1958. (Report no. 2), by H. J. Hausman. Ohio State Univ. Research Foundation., Columbus, Ohio. Sep 1958. RF project 735. Contract AT(11-1)-503. 81p. Order from LC. Mi $4.80, ph $13.80. AECU-3885

Research and investigation leading to methods of generating and detecting radiation in the 100 to 1000 micron wavelength range of the spectrum. Quarterly progress report no. 10 for June 1, 1958 to September 1, 1958, by P. D. Coleman and others. Univ. of Illinois. Electrical Engineering Research Lab., Urbana, Ill. Sep 1958. Contract AT(11-1)-392. 55p. Order from LC. Mi $3.60, ph $9.30. AECU-3900

Multicomponent fractionation, by E. Von Halle. Appendix I: Multicomponent productivity, by G. B. Knight. Appendix II: Extrapolation procedure, by G. B. Knight. Oak Ridge Gaseous Diffusion Plant. Oak Ridge, Tenn. Aug 1956. Contract W-7405-eng-26. 23p. Order from LC. Mi $2.70, ph $4.80. AECU-3902

Effect of thermal motion on the X-ray reflectivity of quartz, by D. W. Berreman and TeTse Chang. Univ. of Oregon. Eugene, Oregon. 1954. 23p. Order from LC. Mi $2.70, ph $4.80. AECU-3903

Research on the natural abundance of deuterium and other isotopes in nature. Final report for period ending September 30, 1958, by Harold C. Urey. Univ. of Chicago, Chicago, Ill. 1958. Contract AT(11-1)-101. 11p. Order from LC. Mi $1.80, ph $1.80. AECU-3906

Bibliography on methods of producing aerosols, vapors and gases as test atmospheres, by Ruth M. Hendrickson, com. Los Alamos Scientific Lab. Los Alamos, N. Mex. May 1958. Contract W-7405-eng-36. (D-BIB-26). 44p. Order from LC. Mi $3.30, ph $7.80. AECU-3915

Hydrogenic bound-free gaunt factors, by W. J. Karzas and R. Latter. RAND Corp. Santa Monica, Calif. Jan 1958. Contract AT(39-1)-1477. (RM-2091-AEC; AD-205873). 38p. Order from LC. Mi $3.00, ph $6.30. AECU-3922

Relativistic self-consistent calculation for the normal mercury atom, by Stanley Cohen. RAND Corp. Santa Monica, Calif. Jul 1958. Contract AT(11-1)-135. (RM-2272-AEC; AD-205872). 69p. Order from LC. Mi $3.90, ph $10.80. AECU-3923

Criteria for upward annular two phase flow, by D. H. Brown and others. General Electric Co. General Engineering Lab., Schenectady, N. Y. Oct 1958. (58-GL-288). 19p. Order from LC. Mi $2.40, ph $3.30. AECU-3934

Heat transfer and pressure loss performance of Griscom-Russell special small K-Fin helically finned tubes, by Theodore C. Carnavos. The Griscom-Russell Co. Massillon, Ohio. May 1958. RT-2-58. 40p. Order from OTS. $1.25. AECU-3970

Some experiments on electrical conduction in vacuum, by Joseph W. Kennedy and others. U. S. A. E. C. Washington University. St. Louis, Missouri. Dec 1957. Contract AT(11-1)-85, project no. 8. 64p. Order from OTS. $1.75. AECU-3989

Summer lectures on theoretical physics, 1958, by R. Haag and others. Argonne National Lab. Lemont, Ill. Mar 1959. Contract W-31-109-eng-38. 253p. Order from OTS. $4.00. ANL-5982

A study of share matrix programs, by R. G. Herrmann and M. R. Smith. General Electric Co. Aircraft Nuclear Propulsion Dept., Cincinnati, Ohio. Sep 1958. Contract AT(11-1)-171. (XDC-58-9-204). 9p. Order from LC. Mi $1.80, ph $1.80. APEX-427

Steady-state and transient thermal stresses in a tube subjected to internal heating, by H. A. Eagle and A. L. Ross. General Electric Co. Atomic Products Div., Aircraft Nuclear Propulsion Dept., Cincinnati, Ohio. Oct 1955. Contract AF 33(600)-38062 and AT(11-1)-171. 27p. Order from OTS. $1.00. APEX-460

Off-center control rod program (digital computer program K), by C. L. Moore. General Electric Co. Aircraft Nuclear Propulsion Dept., Atomic Products Div., Cincinnati, Ohio. Feb 1959. Contracts AF 33(600)-38062 and AT (11-1)-171. 131p. Order from OTS. $2.75. APEX-461

Thermal stress in tube with axial temperature gradient, by R. J. Dunholter. General Electric Co. Atomic Products Div., Aircraft Nuclear Propulsion Dept., Cincinnati, Ohio. Oct 1957. Contracts AF 33(600)-38062 and AT(11-1)-171. 25p. Order from OTS. $1.00. APEX-463

Total pressure loss in mixing of skewed velocity profiles, by R. N. Noyes. General Electric Co. Aircraft Nuclear Propulsion Dept., Cincinnati, Ohio. Oct 1958. (XDC-58-10-165). 7p. Order from LC. Mi $1.80, ph $1.80. APEX-465

Postirradiation examination and evaluation of an OMRE fuel assembly, by Richard J. Burian and John E. Gates. Battelle Memorial Inst. Columbus, Ohio. Feb 1959. Contract W-7405-eng-92. 69p. Order from OTS. $2.25. BMI-1319

Some studies of water, styrofoam and plexigas reflectors, by J. K. Fox and L. W. Gilley. Oak Ridge National Lab. Oak Ridge, Tenn. Oct 1958. Contract W-7405-eng-26. 6p. Order from LC. Mi $1.80, ph $1.80. CF-58-9-39

Asymptotic values of the heat transfer coefficient for laminarBingham plastic flow in pipes, by R. P. Wichner. Oak Ridge National Lab. Oak Ridge, Tenn. Oct 1958. Contract W-7405-eng-26. 7p. Order from LC. Mi $1.80, ph $1.80. CF-58-10-121

A variational method for calculating geometrical bucklings, by G. D. Joanou. General Electric Co. Hanford Atomic Products Operation, Richland, Wash. Oct 1958. Contract W-31-109-Eng-52. 7p. Order from LC. Mi $1.80, ph $1.80. HW-57709

The effect of temperature on the neutron attenuation of magnetite concrete, by D. E. Wood. General Electric Co. Hanford Atomic Products Operation, Richland, Wash. Dec 1958. Contract W-31-109-Eng-52. 30p. Order from OTS. $1.00. HW-58497

The worth of single control rods in hydrogeneous reactors, by D. R. Bach and M. E. Way. General Electric Co. Knolls Atomic Power Lab., Schenectady, N. Y. Jul 1958. Contract W-31-109-Eng-52. 34p. Order from OTS. $1.00. KAPL-1961

Compilation of experimental burnout data as of March 1958, by Sheila A. Ryan and others. Knolls Atomic Power Lab. Schenectady, N. Y. Nov 1958. Contract W-31-109-Eng-52. 89p. Order from OTS. $4.80, ph $13.80. KAPL-M-D1G-TD-4

S3G wire scanner, by D. R. Wehner. Knolls Atomic Power Lab. Schenectady, N. Y. Oct 1958. Contract W-31-109-Eng-52. 18p. Order from LC. Mi $2.40, ph $3.30. KAPL-M-DRW-1

A one dimensional intermediate reactor computing program, by C. B. Mills and F. Brinkley. Univ. of California. Los Alamos Scientific Lab., Los Alamos, N. Mex. Mar 1957. Contract W-7405-ENG-36. 95p. Order from OTS. $2.50. LA-2161

Two-group calculations of the critical core size of the SRE reactor, by F. L. Fillmore. North American Aviation, Inc. Atomics International, Canoga Park, Calif. Jan 1959. Contract AT (11-1)-GEN-8. 49p. Order from OTS. $1.25. NAA-SR-1517(Revised)

Thermal neutron spectrum in harmonically bound hydrogen moderators, by E. R. Cohen and E. U. Vaughan. North American Aviation, Inc. Atomics International, Canoga Park, Calif. Jan 1959. Contract AT(11-1)· GEN-8. 23p. Order from OTS. 75 cents. NAA-SR-3377

Penetration of neutrons from a point fission source through beryllium and beryllium oxide, by H. Goldstein and H. Mechanic. For General Electric Co. Aircraft Nuclear Propulsion Dept. Nuclear Development Corp. of America. White Plains, N. Y. Jun 1958. Subcontract AT-74-ANPG-05339. 27p. Order from LC. Mi $2.70, ph $4.80. NDA-2092-9

Air shower observations between 5,200 M and 3,260M altitude, by Kurt Sitte and others. Syracuse Univ. Research Inst. Syracuse, N. Y. Jul 1957. Contract AT(30-1)-627. (PHY-90-1577F). 39p. Order from LC. Mi $3.00, ph $6.30. NYO-6562

Reaction cross section for 4 Mev deuterons on Cu^{63}, by I. Slaus and W. Parker Alford. Univ. of Rochester. Rochester, N. Y. Nov 1958. Contract AT(30-1)-875. 12p. Order from LC. Mi $2.40, ph $3.30. NYO-8059

Determination of the neutron diffusion parameters in room temperature beryllium, by G. de-Saussure and E. G. Silver. Oak Ridge National Lab. Oak Ridge, Tenn. N.D. Contract W-7405-eng-26. 36p. Order from OTS. $1.25. ORNL-2641

Neutron capture cross-sections of Ag^{107} and In^{115}. Summary report on cross-section measurements, (1955-1956), by R. H. Rohrer and others. Univ. of North Carolina. Chapel Hill, N. C. Dec 1956. Contract AT(40-1)-1076. (M-6096). 8p. Order from LC. Mi $1.80, ph $1.80. ORO-180

Distribution-free tolerance limits, by D. B. Owen-5125. Sandia Corp. Albuquerque, N. Mex. Jun 1957. Contract AT-(29-1)-789. Jun 1957. 18p. Order from OTS. 75 cents. SCTM-66A-57-51

A discussion of the analysis of 2 x 2 tables, by J. M. Wiesen - 5125 and others. Sandia Corp. Albuquerque, N. Mex. Oct 1956. 60p. Order from OTS. $1.75. SCTM-170-56-51

Statistical estimates of parameters in life test distributions, by R. G. Miller, Jr., 5125. Sandia Corp. Albuquerque, N. Mex. Nov 1956. 64p. Order from OTS. $1.75. SCTM-216-56-51

Semi-empirical neutron cross sections 0.5 - 15 Mev. Part II, by Robert J. Howerton. Univ. of California. Lawrence Radiation Lab., Livermore, Calif. Nov 1958. Contract W-7405-eng-48. 273p. Order from OTS. $4.00. UCRL-5351

A possible test of time reversal in Mu-meso. decay, by T. Kotani. Univ. of California. Radiation Lab., Berkeley, Calif. Mar 1957. Contract W-7405-eng-48. 6p. Order from LC. Mi $1.80, ph $1.80. UCRL-3704

High temperature classical equation of state, by B. J. Alder and E. B. Smith. Univ. of California. Lawrence Radiation Lab., Livermore, Calif.

Nov 1958. Contract W-7405-eng-48. 37p. Order from OTS. $1.00. UCRL-5412-T

Analysis of the K^- beam transmitted by the Murray spectrometer, by John N. Dyer. Univ. of California. Lawrence Radiation Lab., Berkeley, Calif. Jan 1959. Contract W-7405-eng-48. 7p. Order from OTS. 50 cents. UCRL-8364Suppl.

Physics division semiannual report May through October 1958. Univ. of California. Lawrence Radiation Lab., Berkeley, Calif. Dec 1958. Contract W-7405-eng-48. 88p. Order from OTS. $2.25. UCRL-8545

The effect of burnable poisons on the regeneration factor η, for slightly enriched uranium metal, by W. R. Clancey. Westinghouse Electric Corp. Atomic Power Div., Pittsburgh, Pa. Nov 1954. Decl. Oct 1958. 24p. Order from LC. Mi $2.70, ph $4.80. WAPD-P-564

Thermal neutron flux in laminar lattices, by Milton Danzker. Westinghouse Electric Corp. Atomic Power Div., Pittsburgh, Pa. Sep 1952. Decl. Sep 1958. Contract AT-11-1-GEN-14. 25p. Order from LC. Mi $2.70, ph $4.80. WAPD-T-15

A code to invert the Fourier sine or cosine transform - FTI-2, by W. H. Guilinger and others. Westinghouse Electric Corp. Bettis Atomic Power Div., Bettis Plant, Pittsburgh, Pa. Oct 1958. Contract AT-11-1-GEN-14. 11p. Order from OTS. 50 cents. WAPD-TM-46(Add.)

F0020 - an IBM-704 thermal transient analysis code, by J. B. Callaghan and J. S. Williams, Jr. Westinghouse Electric Corp. Bettis Atomic Power Div., Bettis Plant, Pittsburgh, Pa. Jan 1959. Contract AT-11-1-GEN-14. 41p. Order from OTS. $1.25. WAPD-TM-145

Heat - a one-dimensional heat transfer equation code for the IBM-704, by C. M. King and R. F. Boyle. Westinghouse Electric Corp. Bettis Atomic Power Div., Bettis Plant, Pittsburgh, Pa. Jan 1959. Contract AT-11-1-GEN-14. 15p. Order from OTS. 50 cents. WAPD-TM-155

Progress Reports

Annual report July 1, 1958. Brookhaven National Lab. Associated Universities, Inc., Upton, N. Y. 1958. Contract AT-30-2-GEN-16. 204p. Order from OTS. $3.50. BNL-523(AS-12)

Quarterly progress report for April, May, June, 1958 Reactor Projects Brance W. E. Nyer, Manager, by G. O. Bright. Phillips Petroleum Co. Idaho Operations Office, Idaho Falls, Idaho. Jan 1959. Contract AT(10-1)-205. 141p. Order from OTS. $2.75. IDO-16489

Quarterly progress report for the period July 1 to September 30, 1958, by R. W. Garbe and H. E. Walchli. For the Yankee Atomic Electric Co. Westinghouse Electric Corp. Atomic Power Dept., Pittsburgh, Pa. Nov 1958. Contract AT(30-3)-222, subcontract no. 1. 108p. Order from OTS. $2.50. YAEC-97

Radiation Effects on Materials

Ionic conductivity of gamma irradiated sodium chloride (thesis), by Herbert Smith Ingham, Jr. Carnegie Inst. of Tech. Pittsburgh, Pa. Sep 1958. Contract AT(30-1)-1828. 124p. Order from LC. Mi $6.30, ph $19.80. NYO-7962

US/UK graphite conference held at St. Giles Court, London December 16-18, 1957. U. S. A. E. C. Div. of Reactor Development, Washington, D. C. and United Kindom Atomic Energy Authority Industrial Group. Windscale Works, Sellafield, Cumb., England. Mar 1959. 159p. Order from OTS. $1.75. TID-7565(Pt. 1)

Radioactive Waste

Geology and hydrology for disposal of radioactive wastes to ground at the Savannah River Plant, by Stanley O. Reichert. E. I. du Pont de Nemours & Co. Explosives Dept. - Atomic Energy Div., Technical Div. - Savannah River Lab., Aiken, S. C. Dec 1958. Contract AT(07-2)-1. 24p. Order from OTS. $1.00. DP-341

Physical characterization of acidic and neutralized synthetic fuel reprocessing waste solutions on evaporation and calcination, by F. M. Empson and I. R. Higgins. Oak Ridge National Lab. Oak Ridge, Tenn. N. D. Contract W-7405-eng-26. 31p. Order from OTS. $1.00. ORNL-2566

Reactors—General

Studies of reactor containment. Combined monthly progress and financial status report no. 18, by T. A. Zaker. Illinois Inst. of Tech. Armour Research Foundation, Chicago, Ill. Nov 1958. Contract AT(11-1)-528. ARF project D132. 7p. Order from LC. Mi $1.80, ph $1.80. AECU-3895

The response of a water boiler reactor to very fast power transients and linearly increasing reactivity inputs, by R. K. Stitt and others. Water boiler excursions with an initially filled core, by J. H. Roecker and R. E. Wimmer. Water boiler excursions with an initially filled core, by D. L. Hetrick. North American Aviation, Inc. Atomics International Div., Canoga Park, Calif. Sep 1958. Contract AT-(11-1)-GEN-8. 19p. Order from LC. Mi $2.40, ph $3.30.
AECU-3929

Feasibility investigation of a closed cycle boiling water reactor for the propulsion of a merchant ship. American Machine and Foundary Co. Greenwich, Conn. Apr 1957. Addendum I Sep 1957. Contract M. A. -1263. 385p. Order from OTS. $5.00. AMF-GR-5-57

Primary shielding calculations on the IBM 650 (ROC codes), by S. S. Rosen and others. Alco Products, Inc. Schenectady, N. Y. Oct 1958. Contract AT(30-3)-326. 41p. Order from LC. Mi $3.00, ph $6.30. APAE-Memo-142

Instrument transmitters for high-pressure, aqueous, nuclear reactors, by R. L. Moore. Oak Ridge National Lab. Oak Ridge, Tenn. Oct 1958. Contract W-7405-eng-26. 29p. Order from LC. Mi $2.70, ph $4.80. CF-58-10-106

HRT-chemical plant run 16 summary, by O. O. Yarbro. Oak Ridge National Lab. Oak Ridge, Tenn. Oct 1958. Contract W-7405-eng-26. 15p. Order from LC. Mi $2.40, ph $3.30.
CF-58-10-111

Summary safeguards report for the nuclear test reactor, by C. G. Andre. General Electric Co. Vallecitos Atomic Lab. Pleasanton, Calif. Oct 1958. 50p. Order from LC. Mi $3.30, ph $7.80. GEAP-3068

The effect of helium solubility in water on an emergency shutdown of the PRTR, by R. W. Moulton. General Electric Co. Hanford Atomic Products Operation, Richland, Wash. Sep 1958. 7p. Order from LC. Mi $1.80, ph $1.80. HW-57376

A study of heat transfer to top shield assemble of the PRTR, by R. W. Moulton. General Electric Co. Hanford Atomic Products Operation, Richland, Wash. Sep 1958. Contract W-31-109-Eng-52. 2p. Order from OTS. $1.80, ph $1.80.
HW-57418

Reactor technology report no. 8 - metallurgy. General Electric Co. Knolls Atomic Power Lab., Schenectady, N. Y. Mar 1959. Contract W-31-109-Eng-52. 214p. Order from OTS. $3.50.
KAPL-2000-5

Critical heat flux data at 2000 PSIA for short twisted ribbons, by R. C. Dowling and R. E. Kegan. Knolls Atomic Power Lab. Schenectady, N. Y. Jul 1958. Contract W-31-109-Eng-52. 21p. Order from LC. Mi $2.70, ph $4.80.
KAPL-M-TR-313(Pt. 1)

ERDL critical experiments. Hazards summary report. Martin Co. Nuclear Div., Baltimore, Md. Dec 1957. Decl. Oct 1958. 102p. Order from LC. Mi $5.70, ph $16.80. MND-E-1157

Interim studies of OMR for marine propulsion, by R. E. Stanbridge and R. J. Gimera. North American Aviation, Inc. Atomics International, Canoga Park, Calif. Sep 1957. Contract AT (11-1)-GEN-8. 78p. Order from OTS. $2.25.
NAA-SR-2140

Operating characteristics and design of a full stream bed filter for the NRX-X-1 loop, by L. A. Waldman. Westinghouse Electric Corp. Atomic Power Div., Pittsburgh, Pa. Dec 1955. Contract AT-11-1-GEN-14. 24p. Order from LC. Mi $2.70, ph $4.80. WAPD-AT-172

Two-region critical experiments; hazards summary report, by P. W. Davison and others. Westinghouse Electric Corp. Atomic Power Dept. Pittsburgh, Pa. Nov 1958. 42p. Order from LC. Mi $3.30, ph $7.80. WCAP-1029

Reactors—Power

Initial radiation survey. Section II. Test results DL-S-172 (T-612084). Duquesne Light Co. Shippingport, Pa. First Issue, Sep 1958. 13p. Order from LC. Mi $2.40, ph $3.30.
AECU-3953

Initial radiation survey. Section III. Test results DL-S-172 (T-612084). Duquesne Light Co. Shippingport, Pa. First Issue, Oct 1958. 6p. Order from LC. Mi $1.80, ph $1.80.
AECU-3954

Plant transient analysis of the APPR-1 by analog computer methods. Task no. IV. Phase I, by J. O. Brondel. Phase II, by J. R. Tomonto. Alco Products, Inc. Schenectady, N. Y. Oct 1958. Contract AT(30-3)326. 204p. Order from LC. Mi $7.80, ph $25.80. APAE-38

Summary of Babcock & Wilcox LMFR studies. The Babcock & Wilcox Co. Atomic Energy Div., Lynchburg, Va. Apr 1958. Contracts AT(30-1)-1940 and AEJ-46. 16p. Order from OTS. 50 cents. BAW-1051

Liquid bismuth as a fuel solvent and heat transport medium for nuclear reactors, by O. E. Dwyer and others. Brookhaven National Lab. Upton, N. Y. 1955. 52p. Order from LC. Mi $3.60, ph $9.30. BNL-2432

A liquid metal breeder blanket for power reactors, by J. S. Bryner and others. Brookhaven National Lab. Upton, N. Y. Dec 1957. 23p. Order from LC. Mi $2.70, ph $4.80. BNL-3489

U^{233} breeders—commentary and general remarks, by W. K. Ergen. Oak Ridge National Lab. Oak Ridge, Tenn. Oct 1958. Contract W-7405-eng-26. 11p. Order from LC. Mi $2.40, ph $3.30. CF-58-10-37

Summary of HRE-2 run 13 (initial power operation), by J. R. Engel and others. Oak Ridge National Lab. Oak Ridge, Tenn. Oct 1958. Contract W-7405-eng-26. 61p. Order from LC. Mi $3.60, ph $9.30. CF-58-10-115

Heavy water moderated power reactors. Quarterly progress report for August, September, and October 1958, by L. Isakoff. E. I. du Pont de Nemours & Co. Explosives Dept. - Atomic Energy Div., Technical Div. - Wilmington, Delaware. Jan 1959. Contract AT(07-2)-1. 60p. Order from OTS. $1.75. DP-345

Gas cooled power reactor coolant choice, by H. W. Heacock and R. E. Nightingale. General Electric Co. Hanford Atomic Products Operation, Richland, Wash. Jun 1958. Contract W-31-109-Eng-52. 9p. Order from LC. Mi $1.80, ph $1.80. HW-56362(Rev.)

A moderator-controlled pressurized-water reactor, by W. J. Levdahl. General Electric Co. Knolls Atomic Power Lab. Schenectady, N. Y. Nov 1958. Contract W-31-109-Eng-52. 18p. Order from OTS. 75 cents. KAPL-1994

Physics of intermediate reactors, by C. B. Mills. Univ. of California. Los Alamos Scientific Lab., Los Alamos, N. Mex. Jan 1959. Contract W-7405-ENG-36. 45p. Order from OTS. $1.50. LAMS-2288

The effect of hydrogen in a fast power breeder reactor, by F. A. Clark and W. H. Jens. Nuclear Development Associates, Inc. White Plains, N. Y. Jun 1954. Decl. Nov 1958. 16p. Order from LC. Mi $2.40, ph $3.30. NDA-14-40

Specifications and fabrication procedures for APPR-1 core II stationary fuel elements, by J. E. Cunningham and others. Oak Ridge National Lab. Oak Ridge, Tenn. N. D. Contracts W-7405-eng-26 and AT(30-3)-278. 102p. Order from OTS. $2.50. ORNL-2649

Homogeneous reactor project quarterly progress report for period ending October 31, 1958, by R. B. Briggs and others. Oak Ridge National Lab. Oak Ridge, Tenn. N. D. Contract W-7405-eng-26. 248p. Order from OTS. $4.00. ORNL-2654

Hydroclones and liquid centrifuges. A literature search, compiled by James M. Jacobs. Technical Information Service Extension. Oak Ridge, Tenn. Mar 1959. 8p. Order from OTS. 50 cents. TID-3527

PWR reactor component instruction book. Westinghouse Electric Corp. Bettis Plant, Pittsburgh, Pa. 1958. Chap. 1. Introduction. 18p. Order from LC. Mi $2.40, ph $3.30. TID-7021(Chap. 1)

PWR reactor component instruction book. Westinghouse Electric Corp. Bettis Plant, Pittsburgh, Pa. 1958. Chap. 2. Detailed description. 125p. Order from LC. Mi $6.30, ph $19.80. TID-7021(Chap. 2)

PWR reactor component instruction book. Westinghouse Electric Corp. Bettis Plant, Pittsburgh, Pa. 1958. Chap. 3. Operation and performance. 63p. Order from LC. Mi $3.90, ph $10.80. TID-7021(Chap. 3)

PWR reactor component instruction book. Westinghouse Electric Corp. Bettis Plant, Pittsburgh, Pa. 1958. Chap. 5. Maintenance. 59p. Order from LC. Mi $3.60, ph $9.30. TID-7021(Chap. 5)

PWR fission product activity levels, by K. Y. Vogel and others. Westinghouse Electric Corp. Bettis Plant, Pittsburgh, Pa. May 1958. 21p. Order from LC. Mi $2.70, ph $4.80. WAPD-CDA(I)-88

Pressurized water reactor (PWR) project for the period December 24, 1958 to February 23, 1959. Westinghouse Electric Corp. Bettis Plant,

Pittsburgh, Pa. 1959. Contract AT-11-1-GEN-14. 92p. Order from OTS. $2.25. WAPD-MRP-78

Procedures for the assembly, installation and testing of PWR core 1 reactor components and handling equipment. Westinghouse Electric Corp. Bettis Plant, Pittsburgh, Pa. Sep 1958. Contract AT-11-1-GEN-14. 449p. Order from LC. Mi $11.10, ph $73.80. WAPD-PWR-RD-566

Core 1 control rod drive mechanism periodic tests. Section I. Periodic (first issue). Test evaluation DL-S-148 (T-550011), by P. W. Secrist and E. G. Shockey. Westinghouse Electric Corp. Bettis Plant, Pittsburgh, Pa. Sep 1958. Contract AT-11-1-GEN-14. 11p. Order from LC. Mi $2.40, ph $3.30. WAPD-PWR-TE-22

Technology—Feed Materials

A process for controlling insoluble uranium in ore concentrates. I. Laboratory Investigation. Topical report, by G. P. Lang and others. Mallinckrodt Chemical Works. Uranium Division, St. Louis, Mo. Feb 1959. Contract W-14-108-eng-8. 29p. Order from OTS. $1.00. MCW-1420

A process for controlling insoluble uranium in ore concentrates. II. Analytical Investigation. Topical report, by W. M. Wise and W. C. Stoecker. Mallinckrodt Chemical Works. Uranium Div., St. Louis, Mo. Feb 1959. Contract W-14-108-eng-8. 15p. Order from OTS. 75 cents. MCW-1423

Electrolytic oxidation of chlorides in nitric acid, by Wendell S. Miller and others. National Lead Company of Ohio. Technical Div., Cincinnati, Ohio. Jun 1958. Contract AT(30-1)-1156. 34p. Order from OTS. $1.25. NLCO-721

Technology—Raw Materials

Synergistic uranium extractants: combination of neutral organophosphorus compounds with dialkylphosphoric acids, by C. A. Blake and others. Oak Ridge National Lab. Oak Ridge, Tenn. N.D. Contract W-7405-eng-26. 40p. Order from OTS. $1.25. ORNL-2259

Alkaline Leach Resin-In-Pulp Pilot Plant testing of Monument Valley ore, by W. D. Charles and R. L. Shimmin. National Lead Co., Inc. Raw Materials Development Lab., Winchester, Mass. Jun 1958. Contract AT(49-6)-924. 46p. Order from LC. Mi $3.30, ph $7.80. WIN-83